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RESEARCH MEMORANDUM

for the

United States Air Force

WIND-TUNNEL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF A 0.07-SCALE MODEL OF THE NORTH AMERICAN MX-770 MISSILE

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NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS

WASHINGTON

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WIND-TUNNEL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF A 0.07-SCALE MODEL OF THE NORTH AMERICAN MX-770 MISSILE

By Frank A. Pfyl

SUMMARY

This report presents the results of a wind-tunnel investigation at supersonic speeds to determine the aerodynamic characteristics of the 0.07-scale model of the North American MX-770 missile. The longitudinal characteristics were determined for Mach numbers of 1.4, 1.6, and 1.9 for Reynolds numbers from 2.6 to 5.2 million. The lateral characteristics were obtained for a Mach number of 1.4 at a Reynolds number of 5.2 million.

Because of the large amount of data obtained in the investigation, only representative plots of the basic data at a Mach number of 1.4 are presented. However, all basic data have been tabulated for the reader's use. Most of the data have been cross-plotted so as to present in graphical form the lift, pitching-moment, and rolling-moment effectiveness parameters and trimmer and elevon deflections required for balance at the test Mach numbers of 1.4, 1.6, and 1.9. Cross plots showing the influence of trimmer and rudder deflection on the lateral characteristics and stability derivatives are presented at a Mach number of 1.4.

INTRODUCTION

The North American MX-770 missile is a long-range, ground-to-ground missile which operates at supersonic speeds during the major portion of its flight. Since the supersonic flight characteristics may provide the most significant design problems, a request was made by the U.S. Air Force for a supersonic wind-tunnel investigation of a 0.07-scale model of the missile. This report presents the results of the investigation conducted

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in the Ames 6- by 6-foot supersonic wind tunnel with primary consideration given to the longitudinal, lateral, and directional stability and control characteristics.

NOTATION

All longitudinal aerodynamic coefficients have been resolved to the wind axes and the lateral force and moment coefficients have been referred to the body axes. The following symbols are used in this report:

C_D drag coefficient $\left(\frac{\text{drag}}{qS}\right)$

C_L lift coefficient $\left(\frac{\text{lift}}{qS}\right)$

C_l rolling-moment coefficient $\left(\frac{\text{rolling moment}}{qSb}\right)$

C_m pitching-moment coefficient about the leading edge of the wing mean aerodynamic chord $\left(\frac{\text{pitching moment}}{qS\bar{c}}\right)$

C_n yawing-moment coefficient $\left(\frac{\text{yawing moment}}{qSb}\right)$

C_X chord-force coefficient $\left(\frac{\text{chord force}}{qS}\right)$

C_Y side-force coefficient $\left(\frac{\text{side force}}{qS}\right)$

C_Z normal-force coefficient $\left(\frac{\text{normal force}}{qS}\right)$

C_{BM} tail bending-moment coefficient about an axis parallel to the plane of symmetry, 19.3-percent tail span lengths from the tail-root-chord station[1] $\left(\frac{\text{bending moment}}{qS_V b_V}\right)$

C_{h_T} trimmer hinge-moment coefficient $\left(\frac{\text{trimmer hinge moment}}{qS_T\bar{c}_T}\right)$

$C_{h_{T_{\delta_T}}}$ rate of change of trimmer hinge-moment coefficient with change in trimmer deflection for constant angle of attack measured at $\delta_T = 0^\circ$ $\left(\frac{\partial C_{h_T}}{\partial \delta_T}\right)_\alpha$, per degree

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[1]The root chord lies on the intersection of the vertical-tail-chord plane and the horizontal plane passing through the fuselage reference axis.

$C_{h_{T_\alpha}}$ rate of change of trimmer hinge-moment coefficient with change in angle of attack for constant angles of trimmer deflection measured at $\alpha = 2^\circ \left(\frac{\partial C_{h_T}}{\partial \alpha}\right)_\delta$, per degree

$C_{L_{\delta_E}}$ elevon lift-effectiveness parameter for constant angle of attack measured at $\delta_E = 0^\circ \left(\frac{\partial C_L}{\partial \delta_E}\right)_\alpha$, per degree

$C_{L_{\delta_T}}$ trimmer lift-effectiveness parameter for constant angle of attack measured at $\delta_T = 0^\circ \left(\frac{\partial C_L}{\partial \delta_T}\right)_\alpha$, per degree

$C_{l_{\delta_E}}$ elevon rolling-moment effectiveness parameter for constant angle of attack measured at $\delta_E = 0^\circ \left(\frac{\partial C_l}{\partial \delta_E}\right)_\alpha$, per degree

$C_{m_{\delta_E}}$ elevon pitching-moment effectiveness parameter for constant angle of attack measured at $\delta_E = 0^\circ \left(\frac{\partial C_m}{\partial \delta_E}\right)_\alpha$, per degree

$C_{m_{\delta_T}}$ trimmer pitching-moment effectiveness parameter for constant angle of attack measured at $\delta_T = 0^\circ \left(\frac{\partial C_m}{\partial \delta_T}\right)_\alpha$, per degree

$\frac{L}{D}$ lift-drag ratio

$\frac{A_o}{A_i}$ ratio of cross-sectional area of a free-stream tube entering the duct inlet to that of the cross-sectional area of the duct inlet

M Mach number

R Reynolds number, based on the wing mean aerodynamic chord

S wing area, including area formed by extending the leading and trailing edges to the plane of symmetry, square feet

S_V area of one tail surface above the bending-moment reference axis

S_T trimmer area, including area formed by extending the leading and trailing edges to the plane of symmetry, square feet

V free-stream velocity, feet per second

b wing span, feet

b_V distance between bending-moment reference axis and tip chord measured parallel to the plane of the tail surface, feet

c local wing chord measured parallel to plane of symmetry, feet

$\bar{c}$ wing mean aerodynamic chord $\left(\dfrac{\int_0^{b/2} c^2 dy}{\int_0^{b/2} c\ dy}\right)$, feet

$\bar{c}_T$ trimmer mean aerodynamic chord, feet

q free-stream dynamic pressure $\left(\frac{1}{2}\rho V^2\right)$, pounds per square foot

x,y,z Cartesian coordinates originating at the apex of the fuselage (x measured along the body reference axis, y measured perpendicular to x in the horizontal plane, z measured perpendicular to x in the vertical plane), feet

α angle of attack of fuselage reference axis, degrees

β angle of sideslip, degrees

δ_T angle between fuselage reference axis and trimmer chord measured in a plane perpendicular to the plane of the trimmer surface, degrees

δ_E angle between wing chord and elevon chord measured in a plane perpendicular to the elevon hinge line, degrees

δ_R angle between the tail-surface chord and rudder chord measured in a plane perpendicular to the rudder hinge line, degrees

ρ mass density of air, slugs per cubic foot

Subscripts

E elevon

R rudder

T trimmer

APPARATUS AND EQUIPMENT

Wind Tunnel

The experimental investigation was conducted in the Ames 6- by 6-foot supersonic wind tunnel. In this wind tunnel, the Mach number can be varied from 0.6 to 0.95 and from 1.2 to 1.93 and the stagnation pressure can be regulated to maintain a constant test Reynolds number. To prevent the formation of condensation shock waves, the absolute humidity was maintained at a value of less than 0.0003 pound of water per pound of air. Further information regarding this wind tunnel is presented in reference 1.

Model

A complete 0.07-scale model of the North American MX-770 missile was used in the investigation. The wing of the model, of modified triangular plan form, had no twist or camber. The leading edge was swept back 60°, the tips raked in 30° in a streamwise plane giving an aspect ratio of 1.87. The wing was mounted with 2° negative incidence on the lower part of the fuselage. The section of the wing at the root, in a plane parallel to the plane of symmetry, was derived from the NACA 66-006 airfoil scaled down to 2.84-percent thickness. At the 87.16-percent semispan station, an NACA 66-006 airfoil was used. The ordinates for both sections are given in table I. A photograph of the model mounted in the tunnel is shown in figure 1, and a three-view drawing of the model is shown in figure 2.

For the present investigation, the elevon was mounted on the left wing panel only, extending spanwise from the 35-percent semispan station to the 87.16-percent semispan station. (See table II for elevon area and other model geometric characteristics.)

The canard trimmer, pivoted 1.07 wing mean aerodynamic chord lengths ahead of the apex of the wing, was geometrically similar in plan form to the wing but was provided with 15° dihedral. NACA 66-005 airfoil sections were used for the trimmer. The axes of rotation of both trimmer panels were located at the 66.6-percent trimmer root-chord station. The left trimmer panel only was fitted with a strain gage for measuring hinge moments.

The twin vertical tail surfaces, inclined 25° (tip outward) with respect to the vertical plane of symmetry, were mounted on the motor housings. The leading edge of the vertical surfaces at the root chord was 1.07 M.A.C. lengths (wing) behind the apex of the wing. Ordinates for the tail surfaces are given in table III. Four electrical

strain gages (two strain gages placed in grooves on each side) were mounted in the left vertical tail surface to measure the bending moments in the vertical tail. The axis about which the bending moment was measured, parallel to the fuselage reference axis, was 19.3-percent tail-span lengths from the vertical-tail root-chord station as defined in the section "Notation."

The model was fitted with air inlets to simulate engine operation insofar as the influence of the inlets on the aerodynamic characteristics was concerned. The duct inlets were of nearly circular cross section with inlet areas of 2.20 square inches. The duct exits, at the base of the model, had circular cross sections with outlet areas of 3.80 square inches. The mass flow through the ducts was controlled by flow restrictors placed in the duct exits. For the present investigation, flow restrictors were selected so that the mass-flow ratio corresponded to a value of A_o/A_i of approximately 0.85.

Boundary-layer bleeds were attached to both sides of the fuselage just ahead of the duct inlets as shown in figures 1 and 2.

The wing, canard trimmer, and tail surfaces were constructed of steel and the body of magnesium bar stock and aluminum alloy. All surfaces were polished.

Balance

The aerodynamic forces and moments on the model were measured by means of a six-component sting-mounted electrical strain-gage balance furnished by the U.S. Air Force. The balance is so designed that the normal force, side force, chord force, and rolling moment experienced by the model are measured simultaneously. The pitching moment and yawing moment experienced by the model were calculated from the measured forces which contributed to the above moments. Figure 3 shows a cutaway view of the balance. The unbalance of the electrical circuits of the balance, calibrated in terms of loads and moments, was transmitted to recording-type galvanometers.

TESTS AND PROCEDURES

Range of Test Variables

Measurements of the normal force, chord force, rolling moment, trimmer hinge moment, and vertical stabilizer bending moment were made over a Reynolds number range from 2.6 to 5.2 million. For all

configurations, tests were conducted at the highest value of Reynolds number attainable consistent with permissible model loads. However, for particular configurations, additional tests were made at various Reynolds numbers to ascertain the influence of this Reynolds number change. The angle of attack was varied in increments of 1° from -2° to 12° or to the maximum possible angle obtainable as limited by permissible air loads or choking of the flow. Table IV presents the test conditions for the investigation of longitudinal stability and control.

Measurements of the side force, chord force, rolling moment, and stabilizer bending moment were made for a Mach number of 1.4 at a Reynolds number of 5.2 million. The measurements of these aerodynamic forces were made for angles of sideslip between $\pm 5^{\circ}$ in 1° increments at angles of attack of approximately 2.5° and 8.2°. In addition, the rolling-moment coefficient C_l due to elevon deflection was obtained during the longitudinal investigation for Mach numbers of 1.4, 1.6, and 1.9 and Reynolds numbers of 5.2, 5.2, and 3.1 million, respectively, at $\beta = 0^{\circ}$. Table V presents the configurations, angles of attack, and control deflection angles tested for the lateral investigation.

Reduction of Data

Model and balance considerations.- With the present support system, the angle of attack of the model was varied by translation of the rear supporting strut mechanism, permitting the balance to move as an integral part of the model. The balance readings were reduced to standard NACA coefficient form with all coefficients based upon the geometry of the appropriate wing configuration. In the longitudinal tests, all coefficients were resolved to the wind axes. In the lateral investigation, the coefficients were referred to the body axes. The pitching moment, in both instances, was taken about the leading edge of the mean aerodynamic chord of the wing. The trimmer hinge moment was measured about an axis coincident with the axis of rotation of the trimmer. The vertical stabilizer bending-moment axis has been described in a preceding section.

The determination of the angle of attack and sideslip angle of the model under load necessitated that corrections determined from static calibrations be applied to the measured angle. Corrections were applied for the angular deflection of the sting and balance due to aerodynamic loads and for the free angular movement resulting from internal clearances of the sting support.

The control-surface deflections were determined for static conditions. A study of the effects of aerodynamic moments on the control settings showed negligible effects.

Influence of stream irregularities.- Although longitudinal pressure gradients of significant magnitude exist in the test section of the Ames 6- by 6-foot supersonic wind tunnel, the transverse gradients are of small magnitude at all supersonic Mach numbers. (See reference 1.) To minimize the effects of the stream angles in vertical planes, the model was mounted with the wing in the vertical plane for tests in which longitudinal data were obtained. The lateral investigation was conducted at a Mach number of 1.4 since at this Mach number the inclination and curvature of the stream in the vertical plane are small. The data presented herein are uncorrected for inclination and curvature of the stream, since in previous tests corrections proved to be within the precision of the data.

With reference to the lateral data, the deviation of rolling-moment coefficients from zero at conditions of supposedly zero rolling moments was probably caused by a combination of stream irregularities and model asymmetry. The incremental rolling moments due to control deflection should be unaffected, however.

The streamwise static-pressure gradient in the test section caused a longitudinal buoyant force which was determined by integrating graphically the product of the static pressure and the change in cross-section area of the fuselage along its length. This correction, a function of Mach number, was added to the measured drag coefficient. The values used in this test were:

Mach number	Correction
1.4	-0.0008
1.6	.0022
1.9	.0034

The influence of support interference on the drag of the model, experienced principally as a change in pressure at the base of the model (reference 2), was eliminated by adjusting the pressure at the model base to that of the free stream. The resulting value is the drag coefficient of the forebody.

Precision of Data

No check on the repeatability of experimental wind-tunnel data was made. However, an estimation to determine the accuracy of the data was made by considering the known uncertainties involved in determining or measuring various quantities. The uncertainties arise from errors in reading pressures, recording strain-gage voltages and currents, the effects of calibrating the balance, and measurement of angles. The

square root of the sum of the squares of the maximum possible errors involved in the determination of a quantity was taken as the known uncertainty in the measurements of the quantity. The known uncertainties at two lift coefficients are as follows:

Quantity	Uncertainty for C_L=0	Uncertainty for C_L=0.4
Lift coefficient	±0.0014	±0.004
Side-force coefficient	±.0014	±.004
Drag coefficient	±.002	±.004
Pitching-moment coefficient	±.0015	±.002
Rolling-moment coefficient	±.0009	±.0014
Yawing-moment coefficient	±.0015	±.002
Trimmer hinge-moment coefficient	±.0001	±.0007
Stabilizer bending-moment coefficient	±.0008	±.0009
Angle of attack	±.1°	±.1°
Trimmer deflection angle	±.25°	±.25°
Elevon deflection angle	±.25°	±.25°
Rudder deflection angle	±.25°	±.25°
Mach number	±.01	±.01
Reynolds number	±.03 million	±.03 million

The deviation of the rolling-moment coefficient from zero at supposedly zero rolling moment due to stream irregularities and model asymmetry, as mentioned previously, is an uncertainty that was not taken into consideration in the above table.

RESULTS

In order to expedite the publication of the results of the present investigation, the data are presented without discussion. All the basic data have been tabulated for the reader's use in table VI. The data presented in table VI are for the test conditions of tables IV and V. The test number given in the tables keys the data of table VI to the test conditions of tables IV and V.

In view of the large amount of information relative to the missile aerodynamic characteristics obtained in the investigation, only certain representative plots of the basic data are presented. Most of the data have been cross-plotted so as to present in graphical form the control effectiveness parameters and trimmer and elevon deflections required for balance at the test Mach numbers of 1.4, 1.6, and 1.9.

The representative plots of the basic data mentioned above are given in figures 4 and 5. Figure 4 presents results for two Reynolds numbers

representative of the tests. Because of the small chord of the control surfaces of the model, all configurations were tested at the maximum possible Reynolds number consistent with the structural limitations of the model. As a consequence, the test Reynolds number varies to some small extent with the control surface setting under investigation. In order to ascertain the influence of this Reynolds number change, the comparative plots of figure 4 were made which indicate the influence of the range of Reynolds numbers from 3.9 million to 5.2 million. The comparisons of figures 4(a) and 4(c) show no influence of the Reynolds number in this Reynolds number range for controls undeflected and for elevons deflected. However, the comparison of figure 4(b) shows a small effect in the variation of lift coefficient with angle of attack and pitching-moment coefficient between Reynolds numbers of 4.2 and 5.2 million for trimmer deflected. Figure 5 shows the influence of control-surface deflection on the basic aerodynamic characteristics of the 0.07-scale model of the MX-770 missile.

Longitudinal aerodynamic characteristics with trimmer and elevon deflected.- Figures 6, 7, and 8 present the influence of trimmer and elevon deflection on the lift, drag, and pitching-moment coefficients, and figure 9 shows the influence of trimmer deflection and angle of attack on the hinge-moment coefficient for test Mach numbers of 1.4, 1.6, and 1.9. The lift and pitching-moment effectiveness parameters, $C_{L_{\delta_T}}$ and $C_{L_{\delta_E}}$, and $C_{m_{\delta_T}}$ and $C_{m_{\delta_E}}$, were determined from figures 6 and 8 at trimmer and elevon deflections of 0° for an angle of attack of 2° and are presented as a function of Mach number in figures 10 and 11. The rate of change of hinge-moment coefficient with trimmer deflection, $C_{h_{T_{\delta_T}}}$ (taken at $\delta_T = 0^\circ$ for $\alpha = 2^\circ$) and angle of attack, $C_{h_{T_\alpha}}$ (taken at $\alpha = 2^\circ$ for $\delta_T = 0^\circ$) as a function of Mach number is presented in figure 12.

Figure 13 presents the variation of lift coefficient with angle of attack, the trimmer deflection required for longitudinal balance, the drag coefficient for the balanced condition, and the lift-drag ratio for the balanced condition for an elevon and rudder setting of 0°. Similar cross-plotted data are presented in figure 14 as a function of elevon deflection with the trimmer and rudder deflection set at 0°. Figure 15 presents the variation of the maximum lift-drag ratio with Mach number for the missile balanced through the use of the longitudinal control provided by the trimmer with the elevon undeflected and by the elevon with the trimmer undeflected, and for elevon and trimmer set at zero deflection.

Lateral aerodynamic characteristics.- Representative plots of the basic lateral aerodynamic characteristics are presented in figure 16 wherein the side-force coefficient, the yawing-moment coefficient, and

the rolling-moment coefficient are given for angles of attack of 2.5° and 8.2° for various rudder and trimmer deflections. These data have been cross-plotted to show the influence of trimmer deflection on the rate of change of side force, yawing moment, and rolling moment with angle of sideslip (fig. 17). Figure 18 presents the results of an investigation of the effect of rudder deflection on lateral characteristics. Figure 19 shows the variation of rolling-moment coefficient with elevon deflection at the test Mach numbers of 1.4, 1.6, and 1.9 for various angles of attack. These data have been cross-plotted to show the rolling-moment effectiveness parameter, $C_{l_{\delta_E}}$, as a function of Mach number in figure 20.

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REFERENCES

1. Frick, Charles W., and Olson, Robert N.: Flow Studies in the Asymmetric Adjustable Nozzle of the Ames 6- by 6-Foot Supersonic Wind Tunnel. NACA RM A9E24, 1949.

2. Perkins, Edward W.: Experimental Investigation of the Effects of Support Interference on the Drag of Bodies of Revolution at a Mach Number of 1.5. NACA TN 2292, 1951.

TABLE I.- AIRFOIL ORDINATES

[Stations and ordinates given in percent of local chord, measured perpendicular to wing-chord plane]

NACA 66-006(2.84)			NACA 66-006	
Root chord, $(t/c)_{max}$ = 2.84%			87.16 semispan station $(t/c)_{max}$ = 6%	
Station	Upper surface	Lower surface	Upper surface	Lower surface
0	0	0	0	0
.5	.216	.216	.460	.460
1.25	.325	.325	.690	.690
2.5	.433	.433	.920	.920
5	.597	.597	1.265	1.265
7.5	.723	.723	1.533	1.533
10	.823	.823	1.744	1.744
15	1.004	1.004	2.127	2.127
20	1.130	1.130	2.395	2.395
25	1.242	1.242	2.625	2.625
30	1.312	1.312	2.780	2.780
40	1.403	1.403	2.970	2.970
45	1.420	1.420	3.000	3.000
50	1.411	1.411	2.989	2.989
55	1.385	1.385	2.932	2.932
60	1.329	1.329	2.817	2.817
70	1.095	1.095	2.318	2.318
80	.796	.796	1.648	1.648
90	.502	.502	.996	.996
95	.351	.351	.671	.671
100	.203	.203	.345	.345
L.E. radius: 0.104			L.E. radius: 0.230	

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TABLE II.- PHYSICAL CHARACTERISTICS OF THE MX-770 MODEL

Model characteristics	Wing	Trimmer	Vertical tails
Total area including area within body (sq ft)	2.085	0.367	[a]0.446 [b]0.163
Aspect ratio	1.87	1.87 [c]1.78	1.41
Incidence	-2°	0	0
Dihedral	0	15°	65°
Airfoil section[d]			
Root	Modified NACA 66-006(2.84)[e]	Modified NACA 66-005	Modified biconvex
Tip	Modified NACA 66-006 at 87.16 percent semi-span station	Modified NACA 66-005	Modified biconvex
Sweepback (leading edge)	60°	60°	31.43°

Control-surface data			
Characteristics	Elevons	Trimmer	Rudder
Movable area (sq ft)	0.0520	0.209	[f]0.0798
$\frac{\text{Control area}}{\text{Total wing and/or tail area}}$ (percent)	2.5	- - -	17.8

[a]Both surfaces. Area includes area within body ducts to the root chord.
[b]Area used to determine stabilizer bending-moment coefficient.
[c]Projected in the horizontal plane.
[d]Parallel to plane of symmetry.
[e]NACA 66-006 airfoil with thickness scaled linearly to 2.84-percent maximum thickness ratio.
[f]Both surfaces.

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TABLE III.- VERTICAL TAIL ORDINATES

[Stations and ordinates given in percent of local chord, measured perpendicular to plane of tail surface]

Root chord, $(t/c)_{max} = 5\%$			Tip chord, $(t/c)_{max} = 5\%$	
Station	Upper surface	Lower surface	Upper surface	Lower surface
0	0	0	0	0
.5	.071	.071	.122	.122
1.25	.155	.155	.204	.204
2.5	.268	.268	.327	.327
5	.494	.494	.531	.531
7.5	.719	.719	.735	.735
10	.917	.917	1.020	1.020
15	1.283	1.283	1.306	1.306
20	1.608	1.608	1.633	1.633
25	1.890	1.890	1.878	1.878
30	2.101	2.101	2.122	2.122
40	2.397	2.397	2.408	2.408
45	2.482	2.482	2.490	2.490
50	2.500	2.500	2.531	2.531
55	2.482	2.482	2.490	2.490
60	2.397	2.397	2.408	2.408
70	2.101	2.101	2.122	2.122
75	1.890	1.890	1.878	1.878
80	1.608	1.608	1.633	1.633
81	1.551	1.551	1.592	1.592
	Straight line to trailing edge			
100	.381	.381	.408	.408
L.E. radius: 0.0282			L.E. radius: 0.0816	

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TABLE IV.- LONGITUDINAL TEST CONDITIONS

[B, body; D, ducts; b, boundary-layer bleed; T, trimmer; W, wing; V, vertical-tail surfaces]

Test No.	Mach No.	Reynolds No. (millions)	Configuration of model	δ_T	δ_E	δ_R
1	1.4	4.2	BDbTWV	0	0	0
2	1.6	4.2				
3	1.9	2.6				
4	1.4	5.2				
5	1.6	5.2				
6	1.9	4.2				
7	1.4	4.2		-5°		
8	1.6	4.2		-5°		
9	1.9	2.6		-5°		
10	1.4	4.2		$+5^\circ$		
11	1.6	4.2		$+5^\circ$		
12	1.9	4.2		$+5^\circ$		
13	1.4	5.2		$+5^\circ$		
14	1.6	5.2		$+5^\circ$		
15	1.9	3.1		$+5^\circ$		
16	1.4	3.9		$+10^\circ$		
17	1.6	3.9		$+10^\circ$		
18	1.9	3.9		$+10^\circ$		
19	1.4	3.9		0	$+10^\circ$	
20	1.6	3.9			$+10^\circ$	
21	1.9	3.6			$+10^\circ$	
22	1.4	5.2			$+10^\circ$	
23	1.6	5.2			$+10^\circ$	
24	1.9	3.1			$+10^\circ$	
25	1.4	5.2			-5°	
26	1.6	5.2			-5°	
27	1.9	3.1			-5°	
28	1.4	5.2			-10°	
29	1.6	5.2			-10°	
30	1.9	3.1			-10°	
31	1.4	5.2			-15°	
32	1.6	5.2			-15°	
33	1.9	3.1			-15°	
34	1.4	5.2	BDbTW		0	---
35	1.6	5.2				---
36	1.9	3.1				---
37	1.4	5.2	BDbW	---		---
38	1.6	5.2		---		---
39	1.9	3.1		---		---
40	1.4	5.2	BDbT	0	---	---
41	1.6	5.2			---	---
42	1.9	3.1			---	---
43	1.4	5.2	BDbV	---	---	0
44	1.6	5.2		---	---	
45	1.9	3.1		---	---	
46	1.4	5.2	BDb	---	---	---
47	1.6	5.2		---	---	---
48	1.9	3.1		---	---	---

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TABLE V.- LATERAL TEST CONDITIONS; $M = 1.4$, $R = 5.2 \times 10^6$

[B, body; D, ducts; b, boundary-layer bleed; T, trimmer; W, wing; V, vertical-tail surfaces]

Test No.	Configuration of model	Nominal angle of attack	δ_T	δ_E	δ_R
49	BDbTWV	2.5°	0	0	0
50			-5°		
51			+5°		↓
52	↓		0		+15°
53	BDbTW	↓			---
54	BDbTWV	8.2°	↓		0
55			-5°		
56			+5°		↓
57	↓		0		+15°
58	BDbTW	↓	↓	↓	---

TABLE VI.- LONGITUDINAL AND LATERAL CHARACTERISTICS OF THE 0.07-SCALE MX-770 MISSILE

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
1	-2.27	-0.2068	0.0421	0.0883	- -	0.0013	-0.0308
	-.12	-.0973	.0312	.0595	- -	0	-.0090
	1.54	-.0177	.0281	.0407	- -	-.0003	.0049
	2.40	.0227	.0283	.0329	- -	-.0010	.0120
	3.20	.0627	.0295	.0256	- -	-.0014	.0191
	4.29	.1150	.0328	.0151	- -	-.0020	.0244
	5.38	.1712	.0380	.0044	- -	-.0027	.0269
	6.47	.2304	.0456	-.0078	- -	-.0036	.0279
	7.57	.2907	.0560	-.0214	- -	-.0044	.0289
	8.66	.3501	.0687	-.0348	- -	-.0052	.0314
	9.75	.4085	.0831	-.0478	- -	-.0058	.0351
	10.84	.4670	.1001	-.0606	- -	-.0064	.0404
	11.94	.5295	.1200	-.0733	- -	-.0070	.0482
2	-2.26	-.1898	.0428	.0797	- -	.0011	-.0581
	-.11	-.0871	.0329	.0536	- -	.0002	-.0365
	1.54	-.0128	.0295	.0367	- -	0	-.0209
	2.37	.0246	.0297	.0296	- -	-.0006	-.0133
	3.21	.0641	.0312	.0215	- -	-.0009	-.0088
	4.29	.1149	.0348	.0117	- -	-.0015	-.0037
	5.38	.1679	.0403	.0007	- -	-.0020	-.0017
	6.46	.2219	.0474	-.0105	- -	-.0028	.0003
	7.55	.2756	.0567	-.0216	- -	-.0035	.0020
	8.64	.3290	.0682	-.0332	- -	-.0040	.0048
	9.73	.3828	.0818	-.0446	- -	-.0046	.0078
	10.82	.4368	.0977	-.0559	- -	-.0052	.0126
	12.25	.5107	.1223	-.0704	- -	-.0058	.0218
3	-2.15	-.1599	.0432	.0648	- -	.0002	-.0081
	-.06	-.0744	.0350	.0453	- -	.0001	.0087
	1.53	-.0084	.0308	.0318	- -	-.0001	.0226
	2.32	.0238	.0304	.0257	- -	-.0002	.0261
	3.11	.0565	.0312	.0201	- -	-.0006	.0284
	4.18	.1016	.0341	.0116	- -	-.0011	.0317
	5.22	.1475	.0386	.0025	- -	-.0015	.0332
	6.26	.1929	.0448	-.0066	- -	-.0020	.0372
	7.31	.2384	.0524	-.0156	- -	-.0023	.0395
	8.36	.2849	.0620	-.0250	- -	-.0029	.0430
	9.40	.3283	.0731	-.0333	- -	-.0032	.0465
	10.44	.3728	.0857	-.0411	- -	-.0035	.0511
	12.53	.4596	.1157	-.0559	- -	-.0045	.0616
4	-2.33	-.2107	.0422	.0888	- -	.0013	-.0312
	-1.23	-.1552	.0357	.0741	- -	.0006	-.0191
	-.14	-.1005	.0313	.0599	- -	0	-.0088
	1.54	-.0182	.0279	.0406	- -	-.0004	.0059
	2.40	.0211	.0279	.0325	- -	-.0011	.0129
	3.26	.0604	.0292	.0230	- -	-.0016	.0170
	4.37	.1148	.0328	.0140	- -	-.0022	.0224
	5.50	.1727	.0383	.0028	- -	-.0030	.0253
	6.62	.2310	.0460	-.0092	- -	-.0038	.0260
	7.74	.2901	.0566	-.0227	- -	-.0046	.0268
	8.90	.3521	.0699	-.0353	- -	-.0053	.0297
5	-2.33	-0.1931	0.0411	0.0797	- - - -	0.0013	-0.0603
	-1.23	-.1407	.0366	.0670	- - - -	.0005	-.0488
	-.13	-.0887	.0326	.0534	- - - -	.0001	-.0378
	1.55	-.0130	.0293	.0366	- - - -	-.0002	-.0212
	2.40	.0234	.0295	.0285	- - - -	-.0007	-.0143
	3.25	.0611	.0309	.0211	- - - -	-.0011	-.0089
	4.35	.1112	.0340	.0106	- - - -	-.0017	-.0040
	5.45	.1623	.0388	.0005	- - - -	-.0022	-.0016
	6.55	.2128	.0459	-.0109	- - - -	-.0029	0
	7.66	.2671	.0554	-.0224	- - - -	-.0036	.0019
	8.77	.3192	.0669	-.0338	- - - -	-.0042	.0046
	9.88	.3724	.0805	-.0454	- - - -	-.0048	.0081
6	-2.23	-.1588	.0390	.0628	- - - -	.0004	-.0153
	-1.16	-.1133	.0342	.0527	- - - -	0	-.0053
	-.09	-.0698	.0305	.0427	- - - -	.0001	.0053
	1.55	-.0039	.0281	.0293	- - - -	-.0002	.0180
	2.37	.0291	.0283	.0235	- - - -	-.0006	.0226
	3.19	.0626	.0296	.0169	- - - -	-.0010	.0260
	4.27	.1090	.0328	.0080	- - - -	-.0013	.0294
7	-2.37	-.2155	.0446	.0487	- - - -	.0039	-.0293
	-.21	-.1074	.0327	.0225	- - - -	.0023	-.0049
	1.44	-.0270	.0286	.0039	- - - -	.0012	.0119
	2.28	.0151	.0282	-.0061	- - - -	.0009	.0207
	3.11	.0549	.0294	-.0150	- - - -	.0001	.0273
	4.20	.1096	.0323	-.0287	- - - -	.0001	.0361
	5.29	.1675	.0369	-.0424	- - - -	0	.0416
	6.37	.2236	.0438	-.0553	- - - -	-.0007	.0454
	7.46	.2802	.0527	-.0691	- - - -	-.0012	.0495
	8.54	.3372	.0641	-.0822	- - - -	-.0016	.0524
	9.63	.3943	.0776	-.0944	- - - -	-.0024	.0577
	10.72	.4523	.0933	-.1064	- - - -	-.0030	.0624
	12.91	.5649	.1313	-.1271	- - - -	-.0044	.0744
8	-2.35	-.1980	.0437	.0427	-0.0004	.0027	-.0565
	-.20	-.0971	.0333	.0179	-.0008	.0014	-.0390
	1.57	-.0206	.0295	.0003	-.0012	.0006	-.0192
	2.28	.0183	.0294	-.0085	-.0014	.0003	-.0103
	3.11	.0566	.0305	-.0169	-.0015	0	-.0034
	4.20	.1074	.0336	-.0289	-.0017	0	.0052
	5.28	.1603	.0385	-.0411	-.0020	-.0003	.0107
	6.36	.2120	.0450	-.0520	-.0022	-.0008	.0146
	7.44	.2632	.0534	-.0631	-.0024	-.0014	.0180
	8.53	.3160	.0640	-.0740	-.0026	-.0017	.0218
	9.61	.3678	.0765	-.0844	-.0027	-.0022	.0255
	10.70	.4186	.0909	-.0944	-.0029	-.0027	.0300
	12.88	.5220	.1257	-.1118	-.0032	-.0040	.0403

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TABLE VI.- CONTINUED

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
9	-2.20	-0.1666	0.0451	0.0298	-0.0007	0.0012	-0.0173
	-.11	-.0791	.0352	.0089	-.0012	.0005	-.0011
	1.36	-.0924	.0316	-.0013	-.0015	0.	.0171
	2.30	.0188	.0311	-.0103	-.0016	-.0005	.0245
	3.06	.0521	.0314	-.0170	-.0018	-.0003	.0302
	4.12	.0961	.0338	-.0258	-.0020	-.0002	.0365
	5.17	.1401	.0377	-.0347	-.0021	-.0003	.0410
	6.21	.1852	.0434	-.0439	-.0024	-.0006	.0450
	7.26	.2307	.0505	-.0519	-.0028	-.0010	.0490
	8.30	.2757	.0594	-.0594	-.0029	-.0018	.0525
	9.35	.3193	.0697	-.0665	-.0031	-.0022	.0559
	10.39	.3628	.0816	-.0734	-.0033	-.0026	.0599
	12.49	.4493	.1103	-.0859	-.0038	-.0033	.0673
10	-2.19	-.1975	.0422	.1213	-.0006	0	-.0353
	-.0362	-.0910	.0333	.0977	-.0012	-.0014	-.0150
	1.61	-.0213	.0309	.0816	-.0017	-.0027	-.0035
	2.44	.0164	.0312	.0762	-.0017	-.0034	.0014
	3.27	.0518	.0324	.0716	-.0018	-.0040	.0064
	4.36	.1023	.0359	.0633	-.0021	-.0049	.0142
	5.44	.1526	.0408	.0532	-.0023	-.0056	.0134
	6.53	.2130	.0490	.0406	-.0025	-.0064	.0124
	7.62	.2667	.0585	.0264	-.0025	-.0070	.0116
	8.73	.3251	.0709	.0118	-.0025	-.0076	.0123
	9.39	.3643	.0801	.0022	-.0024	-.0080	.0136
11	-2.18	-.1835	.0407	.1127	-.0006	.0003	-.0551
	-.02	-.0833	.0327	.0907	-.0010	-.0007	-.0339
	1.60	-.0194	.0303	.0757	-.0014	-.0016	-.0211
	2.42	.0111	.0304	.0712	-.0016	-.0022	-.0156
	3.24	.0467	.0328	.0656	-.0017	-.0027	-.0106
	4.32	.0931	.0354	.0563	-.0018	-.0034	-.0076
	5.40	.1423	.0401	.0452	-.0021	-.0041	-.0090
	6.47	.1940	.0470	.0327	-.0023	-.0046	-.0097
	7.55	.2433	.0557	.0207	-.0025	-.0051	-.0104
	8.63	.2937	.0664	.0079	-.0027	-.0057	-.0099
	9.70	.3443	.0792	-.0053	-.0028	-.0062	-.0071
	10.78	.3942	.0936	-.0181	-.0028	-.0066	-.0024
12	-2.13	-.1489	.0386	.0942	-.0003	.0007	-.0206
	-.02	-.0683	.0305	.0767	-.0003	-.0001	-.0008
	1.61	.0010	.0284	.0685	-.0003	-.0008	.0167
	2.39	.0183	.0283	.0623	-.0005	-.0012	.0194
	3.20	.0502	.0293	.0556	-.0007	-.0016	.0205
	4.26	.0898	.0323	.0468	-.0009	-.0021	.0209
	5.32	.1321	.0369	.0373	-.0012	-.0025	.0221
	6.37	.1770	.0431	.0267	-.0014	-.0029	.0220
	7.43	.2194	.0507	.0169	-.0016	.0034	.0240
	8.49	.2636	.0600	.0071	-.0019	-.0039	.0273
	9.54	.3044	.0703	-.0027	-.0021	-.0043	.0313
	10.59	.3388	.0810	-.0113	-.0024	-.0047	.0360
	12.69	.4200	.1095	-.0288	-.0029	-.0056	.0505
13	-2.24	-.2037	.0432	.1232	-.0009	-.0001	-.0321
	-.02	-.0885	.0337	.0960	-.0015	-.0015	-.0117
	1.68	-.0070	.0313	.0812	-.0020	-.0029	0
	2.54	.0322	.0318	.0754	-.0020	-.0036	.0044
	3.39	.0691	.0337	.0711	-.0021	-.0043	.0089
	4.51	.1244	.0378	.0625	-.0024	-.0051	.0141
	5.63	.1830	.0442	.0518	-.0027	-.0059	.0130
	6.75	.2458	.0533	.0389	-.0029	-.0067	.0113
14	-2.22	-0.1858	0.0430	0.1124	-0.0007	0.0005	-0.0552
	-.02	-.0796	.0345	.0881	-.0012	-.0006	-.0343
	1.68	-.0042	.0324	.0749	-.0016	-.0018	-.0203
	2.53	.0312	.0331	.0699	-.0018	-.0023	-.0148
	3.37	.0690	.0350	.0639	-.0020	-.0029	-.0088
	4.48	.1213	.0391	.0542	-.0022	-.0035	-.0076
	5.59	.1761	.0451	.0429	-.0024	-.0042	-.0090
	6.71	.2327	.0536	.0303	-.0026	-.0048	-.0098
	7.82	.2871	.0650	.0178	-.0028	-.0054	-.0100
15	-2.12	-.1512	.0428	.0952	.0007	.0007	-.0111
	-.0013	-.0608	.0348	.0766	.0001	-.0001	.0096
	1.60	.0014	.0325	.0670	-.0004	-.0008	.0247
	2.39	.0222	.0323	.0603	-.0006	-.0010	.0274
	3.21	.0653	.0334	.0558	-.0007	-.0014	.0286
	4.27	.1093	.0367	.0466	-.0009	-.0019	.0289
	5.33	.1554	.0419	.0368	-.0013	-.0024	.0291
	6.38	.2011	.0487	.0267	-.0016	-.0028	.0292
	7.43	.2466	.0572	.0168	-.0018	-.0033	.0312
	8.49	.2938	.0675	.0065	-.0021	-.0037	.0340
	9.54	.3369	.0787	-.0025	-.0024	-.0042	.0366
	10.61	.3824	.0922	-.0119	-.0028	-.0046	.0412
	12.71	.4691	.1234	-.0293	-.0034	-.0054	.0534
16	-2.39	-.2161	.0489	.1655	-.0013	-.0019	-.0374
	.04	-.0992	.0389	.1376	-.0018	-.0041	-.0151
	1.68	-.0285	.0369	.1245	-.0023	-.0055	-.0056
	2.50	.0068	.0372	.1179	-.0025	-.0061	-.0028
	3.33	.0401	.0385	.1130	-.0022	-.0067	-.0003
	4.42	.0849	.0417	.1068	-.0028	-.0074	.0014
	5.50	.1354	.0464	.0960	-.0031	-.0083	.0014
	6.59	.1935	.0544	.0811	-.0032	-.0089	.0010
	7.66	.2473	.0643	.0650	-.0029	-.0097	0
17	-2.37	-.1978	.0396	.1515	-.0005	-.0006	-.0569
	.03	-.0866	.0398	.1259	-.0011	-.0024	-.0345
	1.66	-.0209	.0381	.1121	-.0015	-.0034	-.0206
	2.48	.0110	.0382	.1061	-.0017	-.0039	-.0166
	3.29	.0404	.0392	.1028	-.0020	-.0043	-.0133
	4.42	.1058	.0440	.0949	-.0023	-.0049	-.0103
	5.45	.1357	.0478	.0817	-.0024	-.0055	-.0117
	6.52	.1845	.0549	.0669	-.0026	-.0059	-.0095
	7.59	.2367	.0643	.0523	-.0028	-.0065	-.0102
	8.79	.2874	.1049	.0371	-.0031	-.0070	-.0131
	9.73	.3361	.0878	.0230	-.0032	-.0075	-.0116
18	-2.34	-.1591	.0451	.1295	.0011	.0002	-.0090
	.04	-.0669	.0376	.1091	.0005	-.0008	.0112
	1.63	-.0122	.0367	.0986	.0003	-.0016	.0277
	2.43	.0171	.0370	.0942	-.0001	-.0021	.0326
	3.23	.0456	.0380	.0889	-.0002	-.0025	.0329
	4.29	.0850	.0409	.0798	0	-.0029	.0302
	5.34	.1272	.0457	.0682	-.0004	-.0034	.0300
	6.40	.1746	.0526	.0553	-.0007	-.0039	.0336
	7.44	.2142	.0599	.0439	-.0013	-.0043	.0343
	8.50	.2655	.0692	.0327	.0019	-.0048	.0328
	9.55	.3008	.0803	.0221	-.0026	-.0053	.0327
	10.59	.3386	.0922	.0124	-.0033	-.0057	.0352
	12.70	.4176	.1208	-.0052	-.0036	-.0067	.0470

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TABLE VI.- CONTINUED

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
19	-2.27	-0.1942	0.0429	0.0744	0.0041	0.0014	-0.0307
	-.12	-.0840	.0328	.0448	.0035	.0001	-.0081
	1.54	-.0027	.0302	.0257	.0032	-.0002	.0060
	2.37	.0351	.0308	.0180	.0032	-.0010	.0127
	3.21	.0775	.0326	.0095	.0032	-.0013	.0190
	4.30	.1326	.0365	-.0012	.0029	-.0019	.0239
	5.39	.1906	.0421	-.0122	.0028	-.0027	.0264
	6.48	:2475	.0501	-.0241	.0026	-.0035	.0277
	7.57	.3074	.0608	-.0373	.0025	-.0044	.0284
	8.67	.3677	.0740	-.0514	.0025	-.0051	.0308
	9.76	.4256	.0890	-.0643	.0026	-.0058	.0349
	10.86	.4873	.1071	-.0774	.0026	-.0063	.0400
20	-2.23	-.1755	.0420	.0679	.0028	.0010	-.0541
	-.10	-.0764	.0339	.0422	.0024	.0002	-.0342
	1.54	-.0040	.0313	.0259	.0021	0	-.0185
	2.38	.0408	.0319	.0188	.0019	-.0006	-.0119
	3.18	.0715	.0336	.0101	.0019	-.0009	-.0069
	4.26	.1216	.0376	.0007	.0018	-.0014	-.0019
	5.33	.1751	.0428	-.0105	.0016	-.0019	0
	6.41	.2291	.0503	-.0216	.0013	-.0025	.0015
	7.48	.2791	.0594	-.0328	.0012	-.0032	.0030
	8.57	.3341	.0714	-.0440	.0009	-.0038	.0057
	9.65	.3874	.0850	-.0556	.0007	-.0044	.0087
	10.70	.4388	.1008	-.0666	.0006	-.0049	.0134
	12.85	.5411	.1377	-.0864	:0003	-.0060	.0263
21	-2.17	-.1430	.0412	.0557	.0023	.00040	-.0075
	-.07	-.0643	.0328	.0360	.0018	.00020	.0103
	1.52	-.0063	.0304	.0229	.0015	0	.0215
	2.32	.0232	.0305	.0167	.0012	-.0003	.0253
	3.11	.0543	.0316	.0106	.0011	-.0007	.0290
	4.18	.0938	.0343	.0024	.0009	-.0012	.0317
	5.23	.1375	.0387	-.0063	.0006	-.0015	.0345
	6.28	.1805	.0446	-.0153	.0004	-.0019	.0372
	7.33	.2250	.0523	-.0242	.0001	-.0023	.0389
	8.38	.2634	.0606	-.0324	-.0001	-.0028	.0414
	9.45	.3183	.0733	-.0411	-.0004	-.0031	.0442
	10.51	.3656	.0866	-.0492	-.0007	-.0036	.0474
	12.62	.4540	.1173	-.0640	-.0011	-.0045	.0574
	14.74	.5390	.1549	-.0759	-.0015	-.0053	.0697
22	-2.34	-.1985	.0434	.0755	.0039	.0013	-.0319
	-.14	-.0859	.0331	.0461	.0033	0	-.0097
	1.56	-.0027	.0302	.0261	.0031	-.0004	.0052
	2.41	.0371	.0307	.0178	.0030	-.0011	.0119
	3.26	.0775	.0326	.0097	.0030	-.0015	.0181
	4.37	.1345	.0367	-.0014	.0027	-.0021	.0225
	5.49	.1926	.0425	-.0130	.0025	-.0029	.0244
	6.61	.2526	.0511	-.0253	.0024	-.0038	.0250
	7.72	.3119	.0620	-.0392	.0024	-.0045	.0261
	8.85	.3759	.0761	-.0536	.0022	-.0053	.0295
	9.95	.4276	.0908	-.0644	,0023	-.0059	.0331
23	-2.32	-0.1795	0.0427	0.0689	0.0028	0.0012	-0.0562
	-.13	-.0775	.0340	.0415	.0024	.0001	-.0358
	1.56	-.0026	.0311	.0257	.0021	-.0001	-.0209
	2.41	.0352	.0317	.0177	.0019	-.0007	-.0134
	3.25	.0733	.0336	.0100	.0017	-.0010	-.0088
	4.35	.1263	.0376	-.0006	.0015	-.0016	-.0050
	5.46	.1810	.0433	-.0118	.0013	-.0021	-.0024
	6.57	.2349	.0512	-.0231	.0012	-.0029	-.0011
	7.68	.2879	.0610	-.0342	.0009	-.0035	.0002
	8.81	.3431	.0737	- -	.0007	-.0042	.0024
	9.73	.3970	.0867	-.0572	.0004	-.0048	.0063
24	-2.18	-.1499	.0420	.0564	.0023	.0004	-.0121
	-.07	-.0632	.0336	.0365	.0020	.0001	.0065
	1.54	.0022	.0311	.0233	.0015	.0001	.0199
	2.34	.0355	.0314	.0171	.0014	-.0003	.0245
	3.15	.0685	.0326	.0109	.0011	-.0007	.0281
	4.21	.1145	.0357	.0022	.0009	-.0011	.0313
	5.27	.1589	.0406	-.0067	.0008	-.0016	.0341
	6.32	.2042	.0471	-.0157	.0005	-.0018	.0369
	7.38	.2504	.0553	-.0246	.0001	-.0023	.0398
	8.43	.2961	.0652	-.0334	-.0002	-.0028	.0432
	9.49	.3397	.0766	-.0415	-.0005	-.0031	.0461
	10.54	.3835	.0895	-.0495	-.0009	-.0036	.0508
	12.65	.4689	.1210	-.0644	-.0015	-.0044	.0598
25	-2.34	-.2196	.0439	.0972	-.0027	-.0001	-.0325
	-.14	-.1081	.0326	.0683	-.0032	0	-.0103
	1.54	-.0253	.0287	.0487	-.0035	0	.0047
	2.40	.0158	.0286	.0403	-.0035	-.0001	.0114
	3.25	.0541	.0300	.0327	-.0037	-.0001	.0176
	4.37	.1106	.0333	.0223	-.0040	-.0001	.0221
	5.48	.1673	.0384	.0116	-.0042	-.0029	.0245
	6.60	.2289	.0465	-.0007	-.0044	-.0038	.0248
	7.72	.2893	.0570	-.0147	-.0045	-.0045	.0259
	8.73	.3444	.0686	-.0273	-.0044	-.0052	.0286
26	-2.27	-.1944	.0428	.0848	-.0025	.0011	-.0553
	.12	-.0945	.0337	.0599	-.0030	.0002	-.0359
	1.54	-.0194	.0302	.0432	-.0032	-.0001	-.0205
	2.37	.0176	.0303	.0358	-.0034	-.0008	-.0136
	3.21	.0552	.0317	.0284	-.0036	-.0010	-.0090
	4.31	.1074	.0350	.0180	-.0037	-.0016	-.0042
	5.40	.1596	.0400	.0076	-.0039	-.0020	-.0022
	6.49	.2138	.0471	-.0032	-.0042	-.0028	-.0003
	7.59	.2679	.0564	-.0150	-.0044	-.0034	.0016
	8.68	.3220	.0679	-.0265	-.0046	-.0041	.0038
	9.77	.3759	.0817	-.0380	-.0047	-.0047	.0070
	10.87	.4310	.0973	.0497	-.0048	-.0053	.0122

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TABLE VI.- CONTINUED

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
27	-2.18	-0.1692	0.0424	0.0702	-0.0016	0.0003	-0.0073
	-.07	-.0776	.0323	.0482	-.0021	.0001	.0102
	1.53	-.0116	.0298	.0350	-.0023	-.0001	.0232
	2.33	.0216	.0295	.0287	-.0025	-.0003	.0274
	3.13	.0547	.0307	.0228	-.0026	-.0006	.0302
	4.20	.0999	.0337	.0141	-.0029	-.0011	.0306
	5.26	.1455	.0384	.0055	-.0031	-.0016	.0329
	6.31	.1915	.0447	-.0032	-.0034	-.0020	.0357
	7.37	.2393	.0528	-.0126	-.0037	-.0025	.0385
	8.43	.2840	.0622	-.0214	-.0039	-.0029	.0412
	9.48	.3268	.0729	-.0294	-.0043	-.0033	.0436
	10.54	.3734	.0858	-.0377	-.0045	-.0037	.0478
	12.65	.4601	.1162	-.0522	-.0051	-.0045	.0578
28	-2.34	-.2267	.0463	.1049	-.0050	.0012	-.0335
	-.13	-.1154	.0348	.0763	-.0055	0	-.0109
	1.53	-.0342	.0306	.0565	-.0057	-.0003	.0042
	2.39	.0056	.0304	.0487	-.0058	-.0011	.0112
	3.25	.0456	.0313	.0407	-.0058	-.0015	.0176
	4.36	.1009	.0344	.0301	-.0061	-.0021	.0223
	5.47	.1584	.0393	.0193	-.0063	-.0029	.0252
	6.59	.2192	.0470	.0069	-.0065	-.0037	.0251
	7.71	.2798	.0573	-.0064	-.0066	-.0045	.0268
	8.83	.3413	.0701	-.0207	-.0066	-.0052	.0290
	9.62	.3861	.0808	-.0306	-.0064	-.0057	.0321
29	-2.31	-.2052	.0450	.0921	-.0044	.0011	-.0576
	-.13	-.1028	.0352	.0667	-.0048	.0001	-.0370
	1.54	-.0250	.0313	.0488	-.0049	-.0001	-.0217
	2.39	.0125	.0314	.0414	-.0051	-.0007	-.0145
	3.24	.0517	.0328	.0336	-.0053	-.0010	-.0099
	4.35	.1038	.0359	.0234	-.0054	-.0015	-.0054
	5.45	.1579	.0409	.0125	-.0057	-.0021	-.0028
	6.56	.2131	.0482	.0014	-.0059	-.0029	-.0011
	7.67	.2664	.0575	-.0097	-.0061	-.0035	.0005
	8.78	.3225	.0693	-.0222	-.0062	-.0041	.0033
	9.89	.3785	.0833	-.0342	-.0063	-.0047	.0067
30	-2.18	-.1646	.0420	.0715	-.0027	.0001	-.0066
	-.08	-.0823	.0338	.0529	-.0032	.0001	.0114
	1.53	-.0177	.0308	.0394	-.0035	-.0001	.0241
	2.33	.0166	.0305	.0331	-.0038	-.0004	.0281
	3.13	.0491	.0314	.0270	-.0039	-.0007	.0313
	4.21	.0934	.0340	.0185	-.0040	-.0010	.0343
	5.26	.1396	.0391	.0100	-.0044	-.0015	.0376
	6.31	.1831	.0447	.0012	-.0046	-.0019	.0395
	7.36	.2293	.0523	-.0078	-.0048	-.0023	.0421
	8.42	.2754	.0616	-.0170	-.0051	-.0028	.0452
	9.48	.3192	.0723	-.0252	-.0053	-.0032	.0483
	10.54	.3650	.0849	-.0334	-.0056	-.0036	.0519
	12.65	.4535	.1160	-.0487	-.0060	-.0043	.0614

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
31	-2.34	-0.2369	0.0499	0.1130	-0.0072	0.0013	-0.0327
	-.14	-.1239	.0372	.0830	-.0077	0	-.0102
	1.53	-.0401	.0328	.0630	-.0077	-.0004	.0048
	2.38	-.0004	.0325	.0549	-.0079	-.0010	.0119
	3.25	.0398	.0334	.0469	-.0080	-.0015	.0176
	4.36	.0940	.0359	.0363	-.0079	-.0021	.0226
	5.48	.1526	.0409	.0254	-.0083	-.0030	.0249
	6.59	.2116	.0485	.0137	-.0086	-.0038	.0254
	7.71	.2712	.0584	.0005	-.0087	-.0046	.0268
	8.83	.3351	.0714	-.0140	-.0087	-.0054	.0299
	9.75	.3856	.0834	-.0252	-.0085	-.0059	.0332
32	-2.31	-.2099	.0472	.0973	-.0061	.0011	-.0565
	-.13	-.1083	.0373	.0720	-.0066	.0002	-.0367
	1.54	-.0312	.0334	.0544	-.0067	-.0001	-.0209
	2.38	.0061	.0333	.0469	-.0069	-.0007	-.0142
	3.24	.0463	.0354	.0390	-.0070	-.0010	-.0088
	4.35	.0968	.0373	.0288	-.0071	-.0015	-.0045
	5.46	.1523	.0423	.0180	-.0074	-.0022	-.0019
	6.56	.2064	.0493	.0072	-.0077	-.0029	-.0005
	7.67	.2605	.0585	-.0041	-.0078	-.0036	.0014
	8.78	.3176	.0702	-.0168	-.0079	-.0042	.0033
	9.90	.3742	.0841	-.0290	-.0079	-.0048	.0070
33	-2.17	-.1727	.0457	.0773	-.0041	.0001	-.0058
	-.08	-.0861	.0361	.0567	-.0044	.0001	.0122
	1.52	-.0214	.0327	.0432	-.0047	0	.0248
	2.32	.0104	.0324	.0374	-.0049	-.0002	.0290
	3.13	.0453	.0330	.0308	-.0051	-.0007	.0323
	4.20	.0882	.0354	.0224	-.0051	-.0010	.0355
	5.25	.1339	.0399	.0140	-.0055	-.0014	.0382
	6.31	.1775	.0453	.0051	-.0057	-.0018	.0413
	7.36	.2242	.0527	-.0041	-.0059	-.0022	.0440
	8.42	.2697	.0617	-.0134	-.0061	-.0028	.0469
	9.47	.3127	.0722	-.0216	-.0063	-.0031	.0501
	10.53	.3581	.0846	-.0301	-.0065	-.0037	.0546
	12.64	.4447	.1138	-.0450	-.0070	-.0045	.0638
34	-2.33	-.1923	.0372	.0770	- - -	.0013	- - -
	-.13	-.0909	.0276	.0536	- - -	0	- - -
	1.55	-.0135	.0237	.0366	- - -	-.0005	- - -
	2.40	.0241	.0239	.0293	- - -	-.0011	- - -
	3.25	.0638	.0257	.0216	- - -	-.0015	- - -
	4.36	.1178	.0291	.0108	- - -	-.0021	- - -
	5.47	.1724	.0343	0	- - -	-.0029	- - -
	6.59	.2303	.0420	-.0117	- - -	-.0037	- - -
	7.70	.2896	.0524	-.0245	- - -	-.0046	- - -
	8.87	.3504	.0655	-.0366	- - -	-.0053	- - -

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TABLE VI.- CONTINUED

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
35	-2.31	-0.1806	0.0383	0.0707	- -	0.0012	- -
	-.13	-.0841	.0291	.0492	- -	.0001	- -
	1.55	-.0112	.0260	.0338	- -	-.0001	- -
	2.40	.0257	.0264	.0262	- -	-.0006	- -
	3.25	.0298	.0279	.0228	- -	-.0004	- -
	4.34	.1131	.0321	.0094	- -	-.0016	- -
	5.45	.1654	.0371	-.0009	- -	-.0021	- -
	6.55	.2160	.0436	-.0111	- -	-.0029	- -
	7.65	.2689	.0530	-.0217	- -	-.0035	- -
	8.75	.3213	.0643	-.0319	- -	-.0041	- -
	9.58	.3621	.0744	-.0401	- -	-.0046	- -
36	-2.21	-.1531	.0373	.0607	- -	.0004	- -
	-.09	-.0719	.0286	.0441	- -	.0001	- -
	1.54	-.0087	.0261	.0315	- -	0	- -
	2.36	.0233	.0256	.0255	- -	-.0005	- -
	3.18	.0556	.0266	.0194	- -	-.0009	- -
	4.25	.0979	.0295	.0115	- -	-.0012	- -
	5.32	.1420	.0341	.0034	- -	-.0017	- -
	6.40	.1854	.0400	-.0043	- -	-.0020	- -
37	-2.27	-.1937	.0368	.0973	- -	- - - -	- -
	-.13	-.0927	.0264	.0537	- -	- - - -	- -
	1.50	-.0178	.0227	.0228	- -	- - - -	- -
	2.33	.0202	.0228	.0067	- -	- - - -	- -
	3.15	.0558	.0242	-.0086	- -	- - - -	- -
	4.23	.1085	.0271	-.0307	- -	- - - -	- -
	5.30	.1608	.0316	-.0530	- -	- - - -	- -
	6.37	.2128	.0381	-.0753	- -	- - - -	- -
	7.45	.2656	.0469	-.0986	- -	- - - -	- -
	8.52	.3198	.0577	-.1221	- -	- - - -	- -
	9.60	.3719	.0704	-.1443	- -	- - - -	- -
38	-2.26	-.1774	.0378	.0890	- -	- - - -	- -
	-.14	-.0965	.0287	.0549	- -	- - - -	- -
	1.51	-.0135	.0245	.0207	- -	- - - -	- -
	2.34	.0225	.0246	.0054	- -	- - - -	- -
	3.17	.0581	.0261	-.0092	- -	- - - -	- -
	4.24	.1056	.0290	-.0288	- -	- - - -	- -
	5.31	.1540	.0332	-.0490	- -	- - - -	- -
	6.38	.2017	.0394	-.0686	- -	- - - -	- -
	7.45	.2484	.0473	-.0876	- -	- - - -	- -
	8.53	.2967	.0574	-.1076	- -	- - - -	- -
	9.60	.3437	.0692	-.1265	- -	- - - -	- -
	10.68	.3915	.0827	-.1456	- -	- - - -	- -
39	-2.17	-.1537	.0354	.0774	- -	- - - -	- -
	-.09	-.0756	.0278	.0455	- -	- - - -	- -
	1.51	-.0136	.0243	.0202	- -	- - - -	- -
	2.30	.0180	.0243	.0075	- -	- - - -	- -
	3.10	.0490	.0252	-.0053	- -	- - - -	- -
	4.16	.0899	.0276	-.0215	- -	- - - -	- -
	5.20	.1292	.0314	-.0370	- -	- - - -	- -
	6.24	.1710	.0371	-.0531	- -	- - - -	- -
	7.28	.2102	.0437	-.0681	- -	- - - -	- -
	8.32	.2509	.0518	-.0831	- -	- - - -	- -
	9.37	.2899	.0612	-.0972	- -	- - - -	- -
	10.41	.3292	.0720	-.1109	- -	- - - -	- -
	12.51	.4074	.0988	-.1365	- -	- - - -	- -

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
40	-2.18	-0.0401	0.0219	-0.0181	- -	0.0012	- - -
	-.04	-.0185	.0196	.0089	- -	0	- - -
	1.58	-.0016	.0193	.0290	- -	-.0003	- - -
	2.38	.0102	.0196	.0398	- -	-.0009	- - -
	3.19	.0198	.0202	.0504	- -	-.0014	- - -
	4.27	.0327	.0214	.0651	- -	-.0020	- - -
	5.35	.0461	.0231	.0806	- -	-.0028	- - -
	6.43	.0593	.0254	.0964	- -	-.0036	- - -
	7.51	.0726	.0284	.1123	- -	-.0043	- - -
	8.59	.0865	.0319	.1292	- -	-.0051	- - -
41	-2.18	-.0420	.0209	-.0160	- -	.0011	- - -
	-.04	-.0183	.0196	.0091	- -	.0002	- - -
	1.57	.0002	.0190	.0276	- -	0	- - -
	2.37	.0094	.0195	.0373	- -	-.0005	- - -
	3.18	.0192	.0201	.0472	- -	-.0010	- - -
	4.26	.0322	.0213	.0612	- -	-.0015	- - -
	5.34	.0462	.0233	.0754	- -	-.0021	- - -
	6.42	.0585	.0255	.0898	- -	-.0027	- - -
	7.49	.0725	.0286	.1045	- -	-.0034	- - -
	8.57	.0863	.0318	.1185	- -	-.0040	- - -
	9.65	.1037	.0364	.1324	- -	-.0046	- - -
42	-2.11	-.0417	.0201	-.0106	- -	.0004	- - -
	-.02	-.0199	.0177	.0112	- -	.0001	- - -
	1.54	-.0024	.0172	.0275	- -	-.0001	- - -
	2.33	.0072	.0173	.0361	- -	-.0003	- - -
	3.11	.0168	.0179	.0447	- -	-.0007	- - -
	4.16	.0291	.0193	.0568	- -	-.0011	- - -
	5.21	.0416	.0212	.0687	- -	-.0015	- - -
	6.26	.0532	.0232	.0809	- -	-.0019	- - -
	7.32	.0671	.0261	.0920	- -	-.0024	- - -
	8.37	.0820	.0298	.1038	- -	-.0028	- - -
	9.42	.0972	.0340	.1142	- -	-.0033	- - -
	10.47	.1140	.0391	.1257	- -	-.0037	- - -
	12.58	.1522	.0519	.1444	- -	-.0045	- - -
43	-2.14	-.0646	.0247	.0259	- -	- - -	-.0742
	-.05	-.0275	.0204	.0150	- -	- - -	-.0282
	1.52	-.0017	.0202	.0081	- -	- - -	.0046
	2.30	.0113	.0206	.0050	- -	- - -	.0205
	3.08	.0239	.0211	.0023	- -	- - -	.0369
	4.13	.0410	.0226	-.0012	- -	- - -	.0581
	5.18	.0577	.0245	-.0046	- -	- - -	.0797
	6.21	.0732	.0269	-.0068	- -	- - -	.1002
	7.24	.0884	.0299	-.0086	- -	- - -	.1201
	8.28	.1038	.0334	-.0100	- -	- - -	.1390
	9.32	.1197	.0374	-.0110	- -	- - -	.1591
	10.36	.1350	.0421	-.0112	- -	- - -	.1779
	12.45	.1671	.0531	-.0105	- -	- - -	.2123
44	-2.14	-.0669	.0270	.0284	- -	- - -	-.0953
	-.05	-.0309	.0229	.0184	- -	- - -	-.0531
	1.51	-.0054	.0224	.0121	- -	- - -	-.0227
	2.30	.0070	.0227	.0093	- -	- - -	-.0078
	3.08	.0194	.0233	.0069	- -	- - -	.0086
	4.12	.0353	.0253	.0041	- -	- - -	.0276
	5.17	.0516	.0262	.0018	- -	- - -	.0471
	6.21	.0668	.0287	.0002	- -	- - -	.0656
	7.24	.0817	.0317	-.0008	- -	- - -	.0833
	8.28	.0962	.0351	-.0013	- -	- - -	.1001
	9.32	.1116	.0391	-.0012	- -	- - -	.1176
	10.36	.1273	.0437	-.0011	- -	- - -	.1343
	12.46	.1615	.0551	.0002	- -	- - -	.1633

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TABLE VI.- CONTINUED

Test No.	α	C_L	C_D	C_m	C_l	C_{h_T}	C_{BM}
45	-2.08	-0.0556	0.0259	0.0219	- -	- - -	-0.0397
	-.03	-.0246	.0225	.0146	- -	- - -	-.0098
	1.51	-.0026	.0315	.0105	- -	- - -	.0134
	2.28	.0083	.0216	.0092	- -	- - -	.0247
	3.05	.0195	.0221	.0077	- -	- - -	.0364
	4.08	.0323	.0232	.0067	- -	- - -	.0505
	5.11	.0474	.0251	.0052	- -	- - -	.0650
	6.14	.0610	.0273	.0048	- -	- - -	.0802
	7.18	.0751	.0292	.0048	- -	- - -	.0950
	8.21	.0893	.0335	.0052	- -	- - -	.1078
	9.23	.1043	.0373	.0058	- -	- - -	.1211
	10.26	.1200	.0418	.0066	- -	- - -	.1332
	12.33	.1547	.0532	.0091	- -	- - -	.1570
46	-2.11	-.0334	.0207	-.0004	- -	- - -	- - -
	-.04	-.0188	.0178	.0082	- -	- - -	- - -
	1.52	-.0076	.0178	.0157	- -	- - -	- - -
	2.29	-.0022	.0178	.0196	- -	- - -	- - -
	3.07	.0029	.0181	.0232	- -	- - -	- - -
	4.11	.0101	.0184	.0284	- -	- - -	- - -
	5.14	.0174	.0191	.0333	- -	- - -	- - -
	6.18	.0251	.0203	.0387	- -	- - -	- - -
	7.22	.0323	.0217	.0436	- -	- - -	- - -
	8.26	.0409	.0234	.0487	- -	- - -	- - -
	9.30	.0495	.0256	.0536	- -	- - -	- - -
	10.35	.0585	.0282	.0588	- -	- - -	- - -
	12.43	.0835	.0349	.0671	- -	- - -	- - -
47	-2.11	-.0360	.0199	.0011	- -	- - -	- - -
	-.04	-.0194	.0175	.0081	- -	- - -	- - -
	1.51	-.0077	.0175	.0155	- -	- - -	- - -
	2.29	-.0017	.0176	.0190	- -	- - -	- - -
	3.07	.0040	.0177	.0226	- -	- - -	- - -
	4.11	.0117	.0182	.0274	- -	- - -	- - -
	5.15	.0191	.0191	.0325	- -	- - -	- - -
	6.19	.0272	.0204	.0374	- -	- - -	- - -
	7.23	.0360	.0219	.0420	- -	- - -	- - -
	8.26	.0454	.0240	.0465	- -	- - -	- - -
	9.32	.0557	.0265	.0511	- -	- - -	- - -
	10.36	.0676	.0294	.0551	- -	- - -	- - -
	12.46	.0963	.0378	.0628	- -	- - -	- - -
48	-2.07	-.0366	.0199	.0044	- -	- - -	- - -
	-.02	-.0195	.0171	.0102	- -	- - -	- - -
	1.51	-.0072	.0160	.0160	- -	- - -	- - -
	2.28	-.0011	.0160	.0188	- -	- - -	- - -
	3.05	.0047	.0161	.0219	- -	- - -	- - -
	4.07	.0124	.0168	.0263	- -	- - -	- - -
	5.10	.0210	.0209	.0304	- -	- - -	- - -
	6.13	.0297	.0223	.0347	- -	- - -	- - -
	7.15	.0388	.0241	.0389	- -	- - -	- - -
	8.18	.0489	.0265	.0431	- -	- - -	- - -
	9.22	.0603	.0293	.0468	- -	- - -	- - -
	10.26	.0737	.0326	.0504	- -	- - -	- - -
	12.32	.1034	.0415	.0563	- -	- - -	- - -

Test No.	β	C_Z	C_X	C_m	C_l	C_Y	C_n	C_{h_T}	C_{BM}	α
49	-5.15	0.0155	0.0272	0.0241	0.0040	0.0736	-0.0142	-0.0007	0.1570	2.50
	-4.12	.0171	.0270	.0254	.0031	.0554	-.0109	-.0005	.1256	2.50
	-3.09	.0165	.0271	.0263	.0023	.0412	-.0083	-.0006	.0995	2.50
	-2.06	.0170	.0273	.0268	.0015	.0272	-.0058	-.0004	.0748	2.50
	-1.02	.0149	.0275	.0275	.0005	.0129	-.0032	-.0004	.0493	2.50
	0	.0163	.0275	.0277	-.0004	-.0010	-.0003	-.0003	.0248	2.50
	1.04	.0163	.0276	.0274	-.0013	-.0157	.0026	-.0004	.0006	2.50
	2.07	.0160	.0274	.0267	-.0021	-.0302	.0053	-.0002	-.0240	2.50
	3.10	.0152	.0274	.0260	-.0028	-.0444	.0078	-.0001	-.0477	2.50
	4.13	.0130	.0275	.0255	-.0035	-.0587	.0105	-.0001	-.0714	2.50
	5.15	.0122	.0276	.0247	-.0042	-.0728	.0132	-.0001	-.0960	2.50
50	-5.15	.0025	.0272	-.0125	.0009	.0714	-.0119	-.0003	.1506	2.54
	-4.13	.0052	.0274	-.0123	.0007	.0563	-.0093	-.0001	.1256	2.54
	-3.09	.0076	.0275	-.0119	.0004	.0411	-.0066	.0003	.1013	2.54
	-2.06	.0073	.0275	-.0110	.0001	.0266	-.0045	.0008	.0774	2.54
	-1.03	.0083	.0276	-.0109	0	.0119	-.0020	.0010	.0537	2.54
	0	.0079	.0279	-.0109	-.0003	-.0015	-.0002	.0013	.0304	2.54
	1.04	.0084	.0278	-.0114	-.0005	-.0156	.0018	.0016	.0073	2.54
	2.07	.0056	.0279	-.0113	-.0008	-.0304	.0042	.0020	-.0159	2.54
	3.11	.0043	.0282	-.0121	-.0010	-.0452	.0066	.0022	-.0385	2.54
	4.14	.0024	.0282	-.0127	-.0012	-.0598	.0092	.0025	-.0608	2.54
	5.12	-.0014	.0282	-.0124	-.0013	-.0751	.0118	.0028	-.0852	2.54
51	-5.13	.0314	.0299	.0633	.0069	.0676	-.0138	-.0022	.1479	2.54
	-4.11	.0298	.0301	.0650	.0056	.0538	-.0110	-.0023	.1226	2.54
	-3.08	.0284	.0303	.0660	.0044	.0394	-.0081	-.0025	.0966	2.54
	-2.05	.0274	.0306	.0673	.0029	.0252	-.0054	-.0026	.0704	2.54
	-1.02	.0257	.0308	.0680	.0014	.0120	-.0028	-.0027	.0463	2.54
	0	.0243	.0308	.0686	-.0005	-.0008	-.0004	-.0028	.0191	2.54
	1.04	.0247	.0309	.0677	-.0024	-.0149	.0023	-.0030	-.0101	2.54
	2.06	.0248	.0308	.0670	-.0039	-.0286	.0049	-.0031	-.0348	2.54
	3.09	.0267	.0308	.0660	-.0052	-.0422	.0075	-.0033	-.0578	2.54
	4.12	.0280	.0307	.0645	-.0064	-.0564	.0104	-.0034	-.0815	2.54
	5.14	.0273	.0305	.0635	-.0077	-.0707	.0133	-.0036	-.1062	2.54
52	-3.09	.0128	.0359	.0317	.0100	.0700	-.0268	-.0005	.1875	2.54
	-2.06	.0137	.0358	.0317	.0090	.0545	-.0235	-.0004	.1601	2.54
	-1.03	.0122	.0358	.0325	.0080	.0400	-.0208	-.0004	.1350	2.54
	0	.0110	.0356	.0325	.0070	.0246	-.0176	-.0004	.1089	2.54
	1.03	.0117	.0353	.0320	.0060	.0096	-.0145	-.0004	.0843	2.54
	2.06	.0110	.0350	.0310	.0052	-.0045	-.0118	-.0002	.0598	2.54
	3.09	.0111	.0347	.0299	.0043	-.0191	-.0090	-.0001	.0353	2.54
	4.12	.0102	.0344	.0290	.0036	-.0333	-.0063	-.0001	.0111	2.54
	5.15	.0072	.0341	.0282	.0029	-.0481	-.0036	-.0001	-.0139	2.54

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TABLE VI.- CONCLUDED

Test No.	β	C_Z	C_X	C_m	C_l	C_Y	C_n	C_{h_T}	C_{BM}	α
53	-5.12	0.0156	0.0239	0.0228	-0.0056	0.0254	0.0120	-0.0006	- - -	2.68
	-4.09	.0181	.0236	.0235	-.0044	.0202	.0094	-.0004	- - -	2.68
	-3.07	.0190	.0237	.0239	-.0033	.0148	.0067	-.0004	- - -	2.68
	-2.04	.0192	.0240	.0245	-.0022	.0096	.0042	-.0004	- - -	2.68
	-1.02	.0208	.0240	.0240	-.0011	.0042	.0017	-.0004	- - -	2.68
	0	.0199	.0242	.0239	0	-.0004	-.0009	-.0003	- - -	2.68
	1.03	.0192	.0244	.0241	.0010	-.0053	-.0034	-.0003	- - -	2.68
	2.05	.0190	.0243	.0235	.0022	-.0103	-.0061	-.0002	- - -	2.68
	3.08	.0193	.0245	.0226	.0033	-.0152	-.0086	-.0001	- - -	2.68
	4.10	.0189	.0246	.0216	.0045	-.0200	-.0113	-.0001	- - -	2.68
	5.13	.0175	.0247	.0203	.0057	-.0249	-.0141	0	- - -	2.68
54	-5.14	.3096	.0185	-.0312	.0110	.0727	-.0144	-.0053	0.1731	8.26
	-4.12	.3095	.0182	-.0300	.0089	.0592	-.0125	-.0050	.1487	8.26
	-3.08	.3103	.0183	-.0295	.0062	.0424	-.0091	-.0049	.1217	8.26
	-2.05	.3106	.0183	-.0298	.0038	.0271	-.0062	-.0047	.0947	8.26
	-1.02	.3107	.0185	-.0300	.0014	.0111	-.0033	-.0046	.0664	8.26
	.01	.3113	.0186	-.0297	-.0008	-.0032	-.00064	-.0045	.0397	8.26
	1.05	.3105	.0185	-.0297	-.0030	-.0194	.0023	-.0042	.0100	8.26
	2.08	.3095	.0186	-.0293	-.0054	-.0353	.0053	-.0041	-.0216	8.26
	3.12	.3092	.0185	-.0296	-.0079	-.0516	.0084	-.0040	-.0572	8.26
	4.14	.3082	.0184	-.0304	-.0105	-.0674	.0114	-.0038	-.1001	8.26
	5.17	.3097	.0186	-.0335	-.0116	-.0796	.0121	-.0038	-.1059	8.26
55	-5.15	.2880	.0163	-.0749	.0070	.0679	-.0101	-.0028	.1753	8.05
	-4.12	.2898	.0164	-.0745	.0055	.0537	-.0084	-.0025	.1516	8.05
	-3.09	.2918	.0163	-.0748	.0039	.0386	-.0063	-.0020	.1282	8.05
	-2.05	.2925	.0164	-.0751	.0023	.0241	-.0043	-.0017	.1044	8.05
	-1.02	.2936	.0166	-.0755	.0007	.0092	-.0024	-.0013	.0799	8.05
	.01	.2934	.0166	-.0760	-.0005	-.0037	-.0006	-.0011	.0582	8.05
	1.05	.2926	.0167	-.0754	-.0021	-.0184	.0016	-.0007	.0334	8.05
	2.08	.2900	.0168	-.0746	-.0037	-.0331	.0034	-.0005	.0081	8.05
	3.12	.2896	.0166	-.0749	-.0051	-.0479	.0053	-.0002	-.0164	8.05
	4.15	.2883	.0165	-.0753	-.0067	-.0630	.0074	-.0001	-.0428	8.05
	5.18	.2865	.0167	-.0763	-.0079	-.0767	.0088	.0001	-.0579	8.05
56	-5.13	0.3234	0.0238	0.0136	0.0146	0.0725	-0.0178	-0.0063	0.1659	8.38
	-4.11	.3205	.0235	.0169	.0122	.0604	-.0163	-.0065	.1382	8.38
	-3.08	.3207	.0234	.0171	.0087	.0450	-.0123	-.0066	.1105	8.38
	-2.05	.3211	.0236	.0172	.0053	.0286	-.0081	-.0067	.0815	8.38
	-1.02	.3218	.0237	.0170	.0018	.0115	-.0037	-.0069	.0507	8.38
	.01	.3229	.0238	.0166	-.0010	-.0034	0	-.0070	.0227	8.38
	1.04	.3230	.0237	.0167	-.0043	-.0205	.0042	-.0070	-.0106	8.38
	2.07	.3187	.0235	.0173	-.0077	-.0374	.0083	-.0070	-.0466	8.38
	3.10	.3201	.0235	.0168	-.0110	-.0542	.0125	-.0071	-.0905	8.38
	4.13	.3209	.0235	.0153	-.0142	-.0692	.0158	-.0071	-.1390	8.38
	5.15	.3254	.0237	.0106	-.0158	-.0789	.0161	-.0072	-.1444	8.38
57	-3.60	.3040	.0264	-.0254	.0148	.0781	-.0280	-.0049	.2144	8.23
	-3.05	.3049	.0265	-.0257	.0131	.0675	-.0258	-.0048	.1971	8.23
	-2.06	.3059	.0259	-.0262	.0106	.0517	-.0226	-.0047	.1704	8.23
	-1.02	.3064	.0255	-.0268	.0082	.0354	-.0192	-.0045	.1410	8.23
	.01	.3065	.0253	-.0266	.0058	.0207	-.0165	-.0044	.1144	8.23
	1.04	.3050	.0249	-.0274	.0034	.0047	-.0134	-.0043	.0847	8.23
	2.07	.3039	.0247	-.0276	.0008	-.0120	-.0101	-.0041	.0509	8.23
	3.11	.3037	.0163	-.0278	-.0016	-.0272	-.0073	-.0040	.0163	8.23
	4.14	.3023	.0237	-.0286	-.0041	-.0436	-.0042	-.0038	-.0280	8.23
	5.17	.3049	.0234	-.0321	-.0053	-.0549	-.0036	-.0037	-.0323	8.23
58	-5.12	.3034	.0149	-.0303	- - -	.0232	.0135	-.0051	- - -	8.23
	-4.09	.3048	.0149	-.0298	- - -	.0182	.0106	-.0049	- - -	8.23
	-3.07	.3060	.0150	-.0296	- - -	.0125	.0075	-.0048	- - -	8.23
	-2.04	.3070	.0150	-.0294	- - -	.0074	.0045	-.0046	- - -	8.23
	-1.01	.3073	.0151	-.0289	- - -	.0024	.0013	-.0044	- - -	8.23
	.01	.3083	.0153	-.0296	- - -	-.0018	-.0018	-.0043	- - -	8.23
	1.04	.3080	.0154	-.0301	- - -	-.0066	-.0050	-.0042	- - -	8.23
	2.06	.3081	.0155	-.0307	- - -	-.0116	-.0081	-.0040	- - -	8.23
	3.09	.3067	.0156	-.0307	- - -	-.0167	-.0113	-.0039	- - -	8.23
	4.12	.3068	.0157	-.0320	- - -	-.0215	-.0145	-.0038	- - -	8.23
	5.15	.3055	.0160	-.0331	- - -	-.0265	-.0176	-.0036	- - -	8.23

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FIGURE LEGENDS

Figure 1.- The 0.07-scale MX-770 model mounted in the Ames 6- by 6-foot supersonic wind tunnel.

Figure 2.- Sketch of the 0.07-scale MX-770 model showing the principal dimensions.

Figure 3.- Schematic drawing of the six-component electrical-strain-gage balance.

Figure 4.- Effect of Reynolds number on the aerodynamic characteristics of the 0.07-scale MX-770 model at a Mach number of 1.4 for various control-surface deflections. (a) $\delta_T = 0^{\circ}$, $\delta_E = 0^{\circ}$, $\delta_R = 0^{\circ}$.

Figure 4.- Continued. (b) $\delta_T = 5^{\circ}$, $\delta_E = 0^{\circ}$, $\delta_R = 0^{\circ}$.

Figure 4.- Concluded. (c) $\delta_T = 0^{\circ}$, $\delta_E = 10^{\circ}$, $\delta_R = 0^{\circ}$. (Data for one elevon)

Figure 5.- The effect of control-surface deflections on the aerodynamic characteristics of the 0.07-scale MX-770 model at a Mach number of 1.4. (a) $\delta_E = 0$, $\delta_R = 0$

Figure 5.- Concluded. (b) $\delta_T = 0$, $\delta_R = 0$. (Data for one elevon)

Figure 6.- Variation of lift coefficient with trimmer and elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model. (a) C_L vs δ_T.

Figure 6.- Concluded. (b) C_L vs δ_E. (Data for one elevon)

Figure 7.- Variation of drag coefficient with trimmer and elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model. (a) C_D vs δ_T.

Figure 7.- Concluded. (b) C_D vs δ_E. (Data for one elevon)

Figure 8.- Variation of pitching-moment coefficient with trimmer and elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model. (a) C_m vs δ_T.

Figure 8.- Concluded. (b) C_m vs δ_E. (Data for one elevon)

Figure 9.- Variation of trimmer hinge-moment coefficient with trimmer deflection and angle of attack at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model. (a) C_{h_T} vs δ_T.

Figure 9.- Concluded. (b) C_{h_T} vs α.

Figure 10.- The effect of Mach number on the lift-effectiveness parameters $C_{L_{\delta_T}}$ and $C_{L_{\delta_E}}$ for the 0.07-scale MX-770 model; δ_E and $\delta_R = 0^\circ$ for $C_{L_{\delta_T}}$ and δ_T and $\delta_R = 0^\circ$ for $C_{L_{\delta_E}}$; $\alpha = 2^\circ$.

Figure 11.- The effect of Mach number on the pitching-moment effectiveness parameters $C_{m_{\delta_T}}$ and $C_{m_{\delta_E}}$ for the 0.07-scale MX-770 model; δ_E and $\delta_R = 0^\circ$ for $C_{m_{\delta_T}}$ and δ_T and $\delta_R = 0^\circ$ for $C_{m_{\delta_E}}$; $\alpha = 2^\circ$.

Figure 12.- The effect of Mach number on the rate of change of hinge-moment coefficient with change in trimmer deflection and angle of attack for the 0.07-scale MX-770 model; δ_E and $\delta_R = 0^\circ$.

Figure 13.- The relationship between the balance lift coefficient and α, δ_T, C_D, and L/D for Mach numbers of 1.4, 1.6, and 1.9; δ_E and $\delta_R = 0$.

Figure 14.- The relationship between the balance lift coefficient and α, δ_E, C_D, and L/D for Mach numbers of 1.4, 1.6, and 1.9. Data for two elevons; δ_T and $\delta_R = 0$.

Figure 15.- The effect of Mach number on the maximum lift-drag ratio for the 0.07-scale MX-770 model.

Figure 16.- The effect of sideslip angle, β, on the lateral characteristics of the 0.07-scale MX-770 model at two angles of attack. Reynolds number, 5.2 million. Mach number, 1.4. (a) $\alpha = 2.5^\circ$.

Figure 16.- Concluded. (b) $\alpha = 8.2^\circ$.

Figure 17.- The effect of trimmer deflection on the lateral-stability derivatives C_{Y_β}, C_{n_β}, and C_{l_β} of the 0.07-scale MX-770 model; δ_E and $\delta_R = 0^\circ$.

Figure 18.- The effect of rudder deflection on the lateral characteristics of the 0.07-scale MX-770 model; $M = 1.4$; δ_T, δ_E, and $\beta = 0^\circ$.

Figure 19.- Variation of rolling-moment coefficient with elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model. Data for one elevon; $\beta = 0^\circ$.

Figure 20.- The effect of Mach number on the rolling-moment effectiveness parameter $C_{l_{\delta_E}}$ for the 0.07-scale MX-770 model. Two elevons, δ_T and $\delta_R = 0^\circ$, $\alpha = 2^\circ$.

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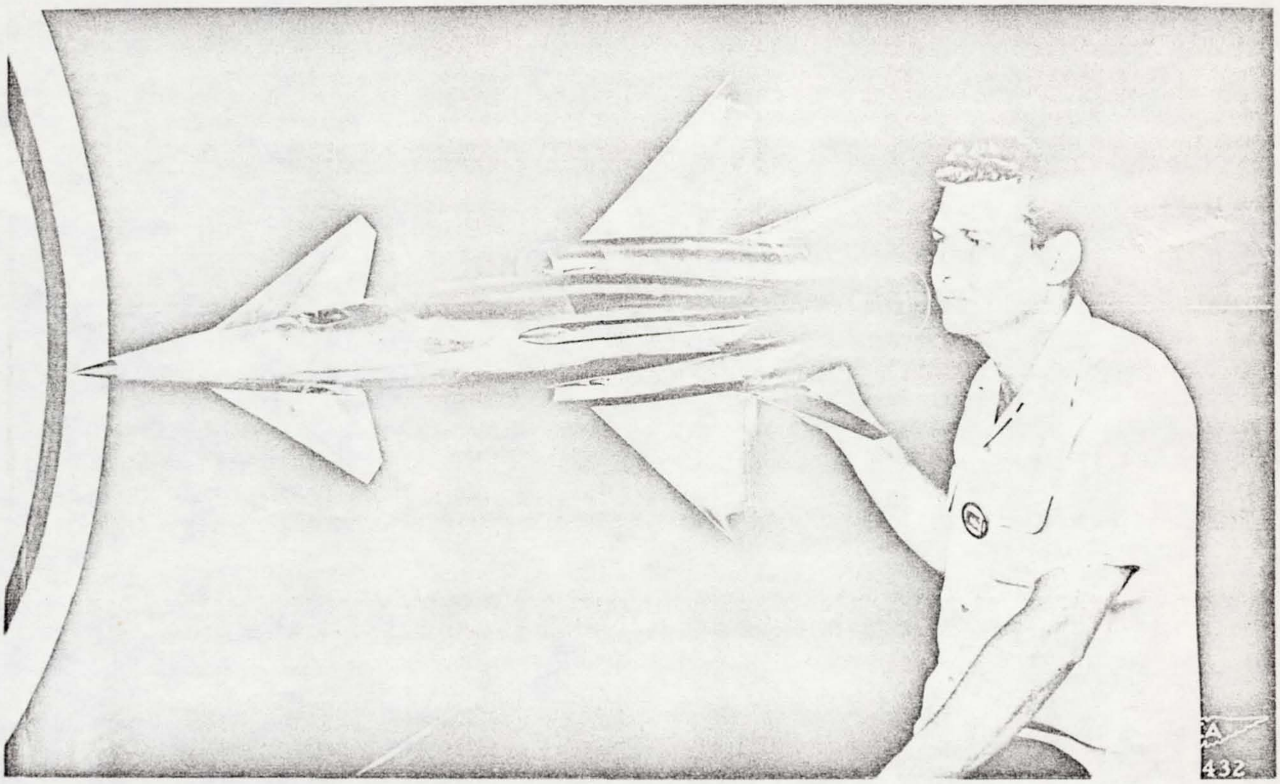


Figure 1.- The 0.07-scale MX-770 model mounted in the Ames 6- by 6-foot supersonic wind tunnel.

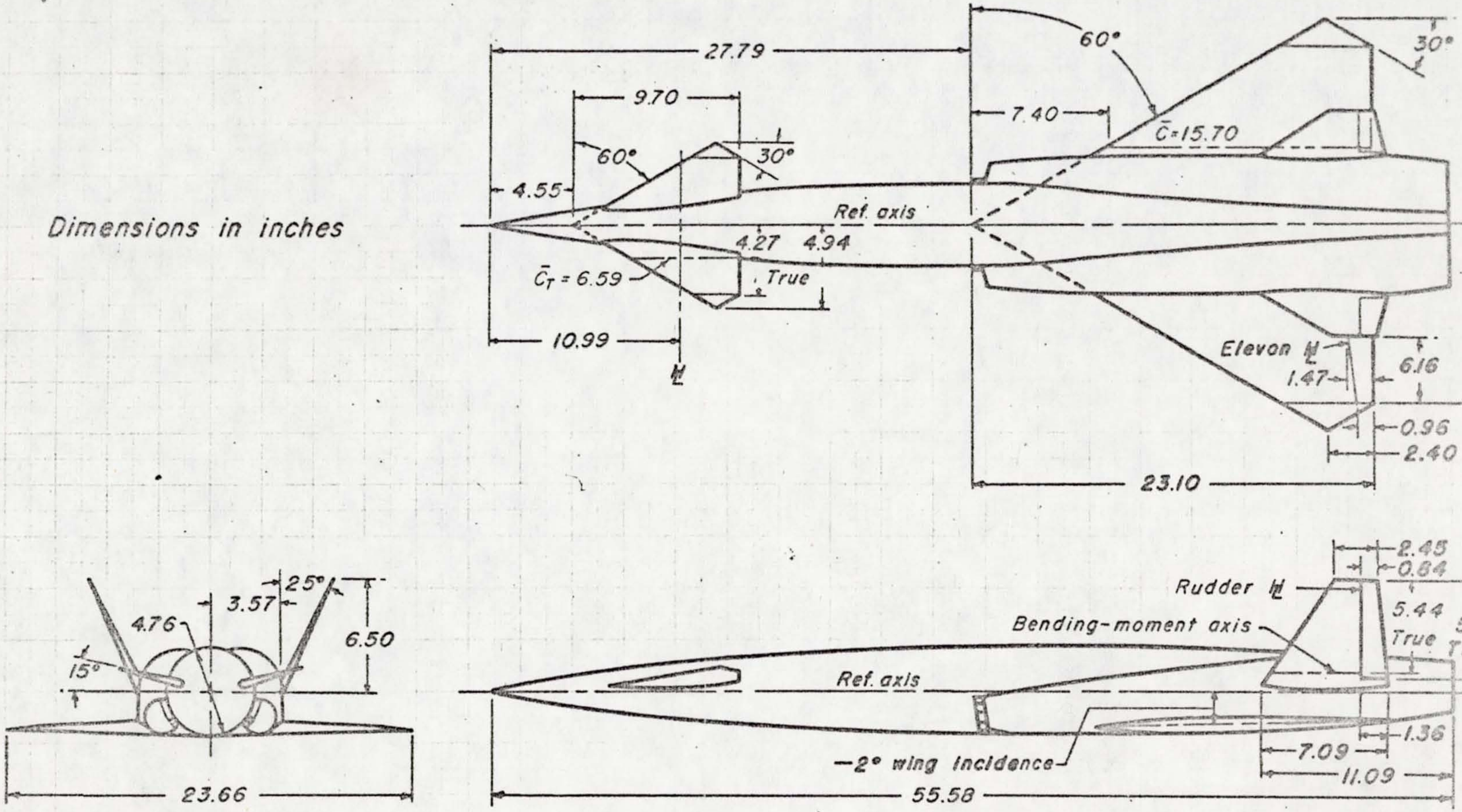


Figure 2.– Sketch of the 0.07–scale MX-770 model showing the principal dimensions.

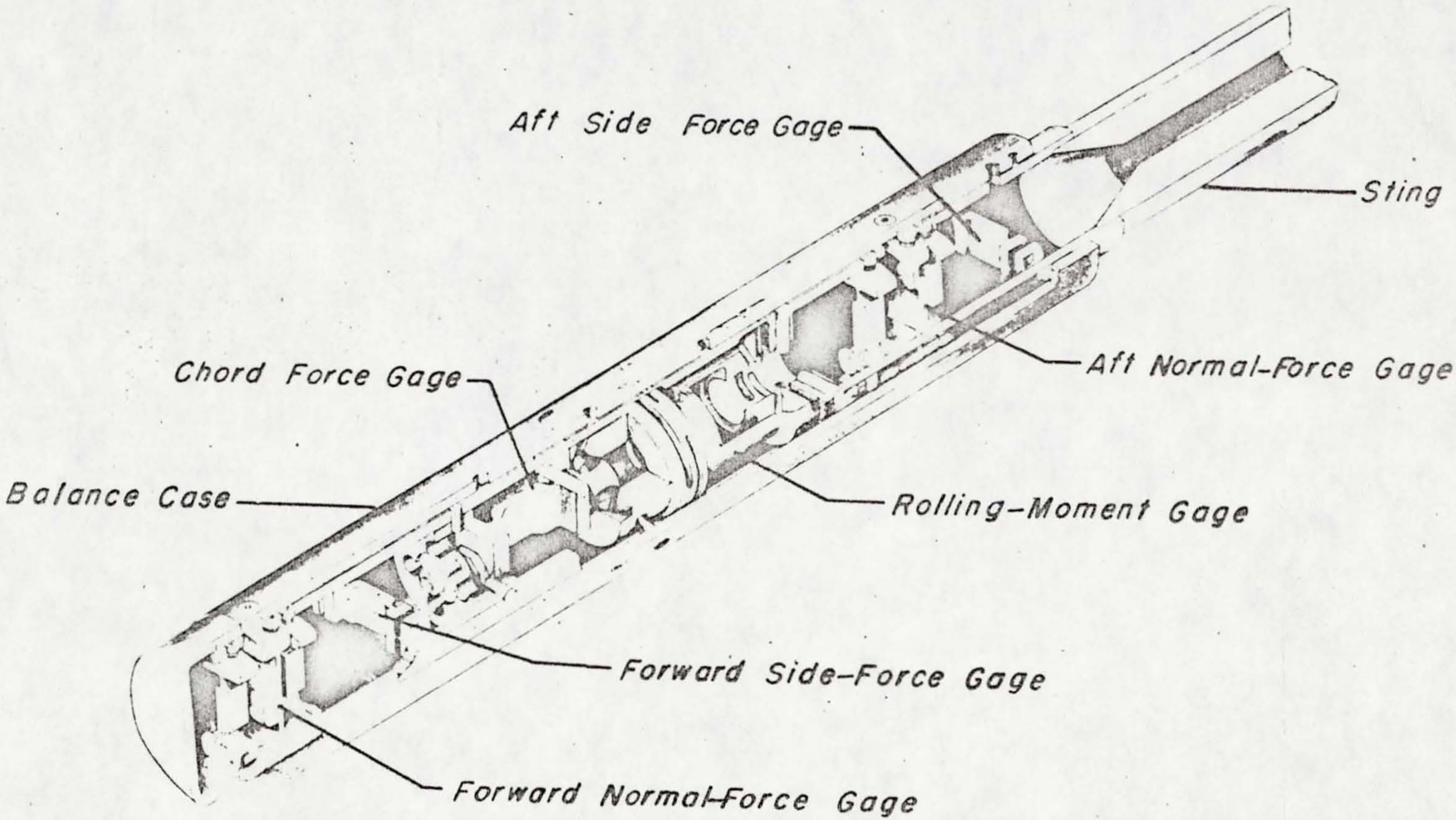
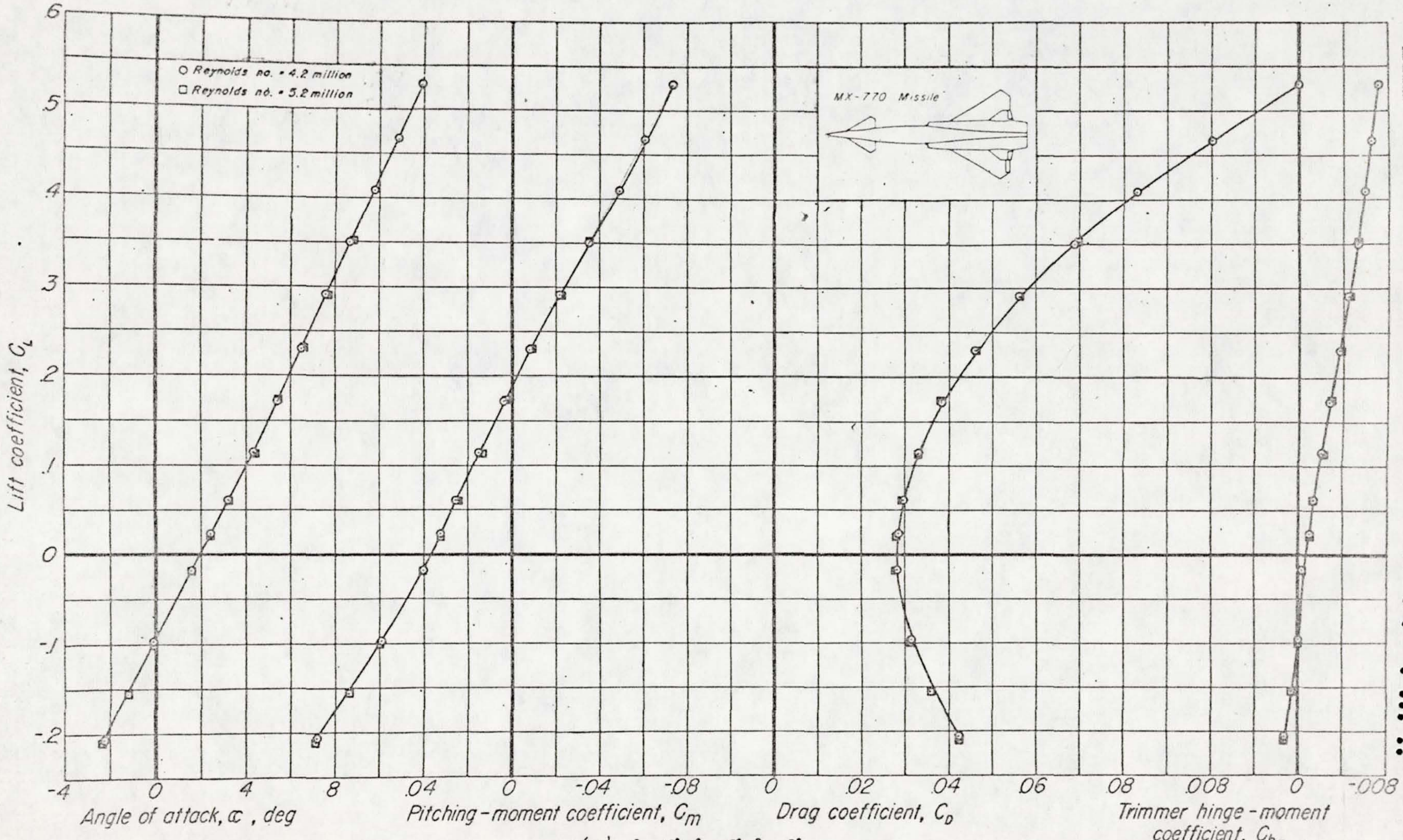
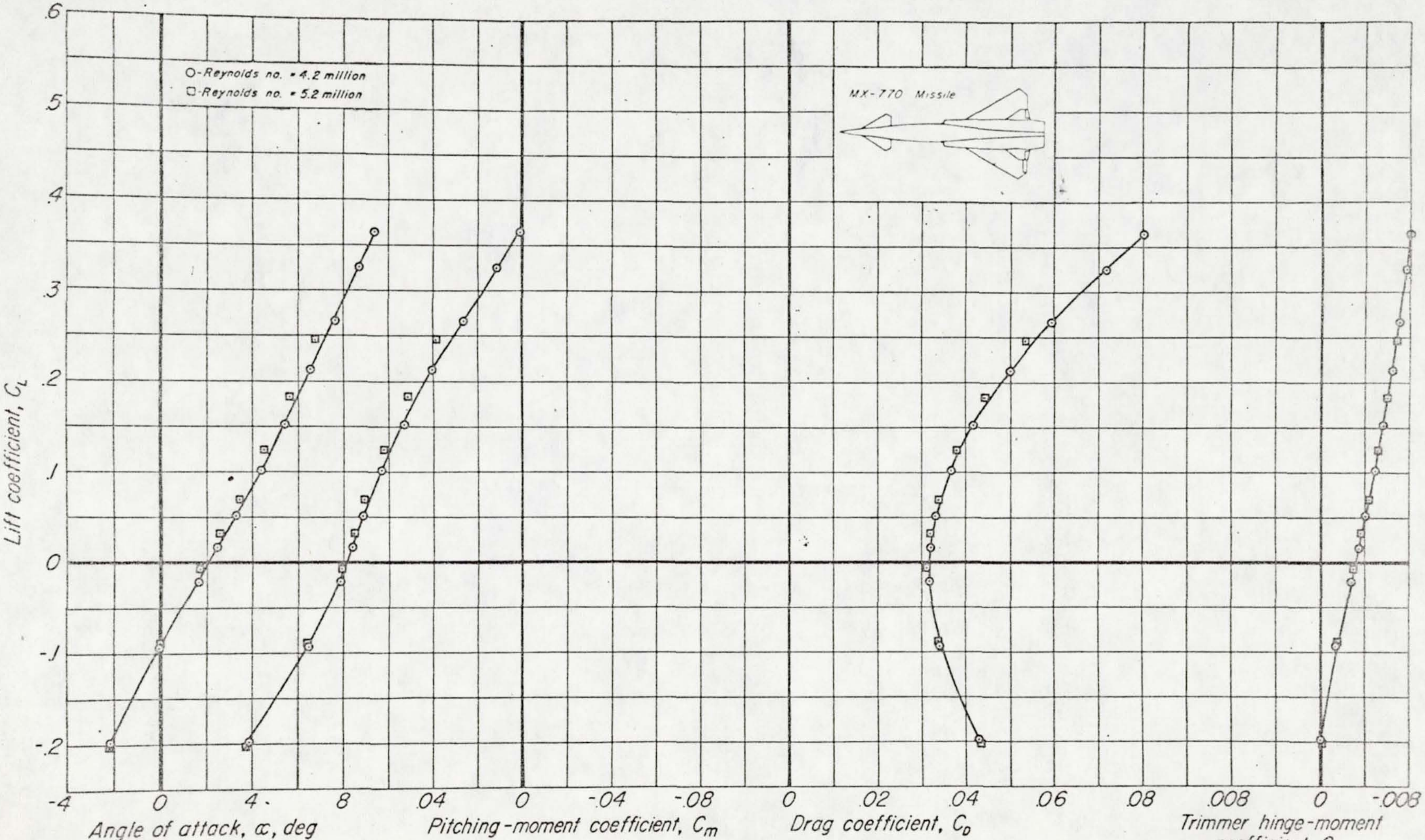


Figure 3.- Schematic drawing of the six-component electrical-strain-gage balance.



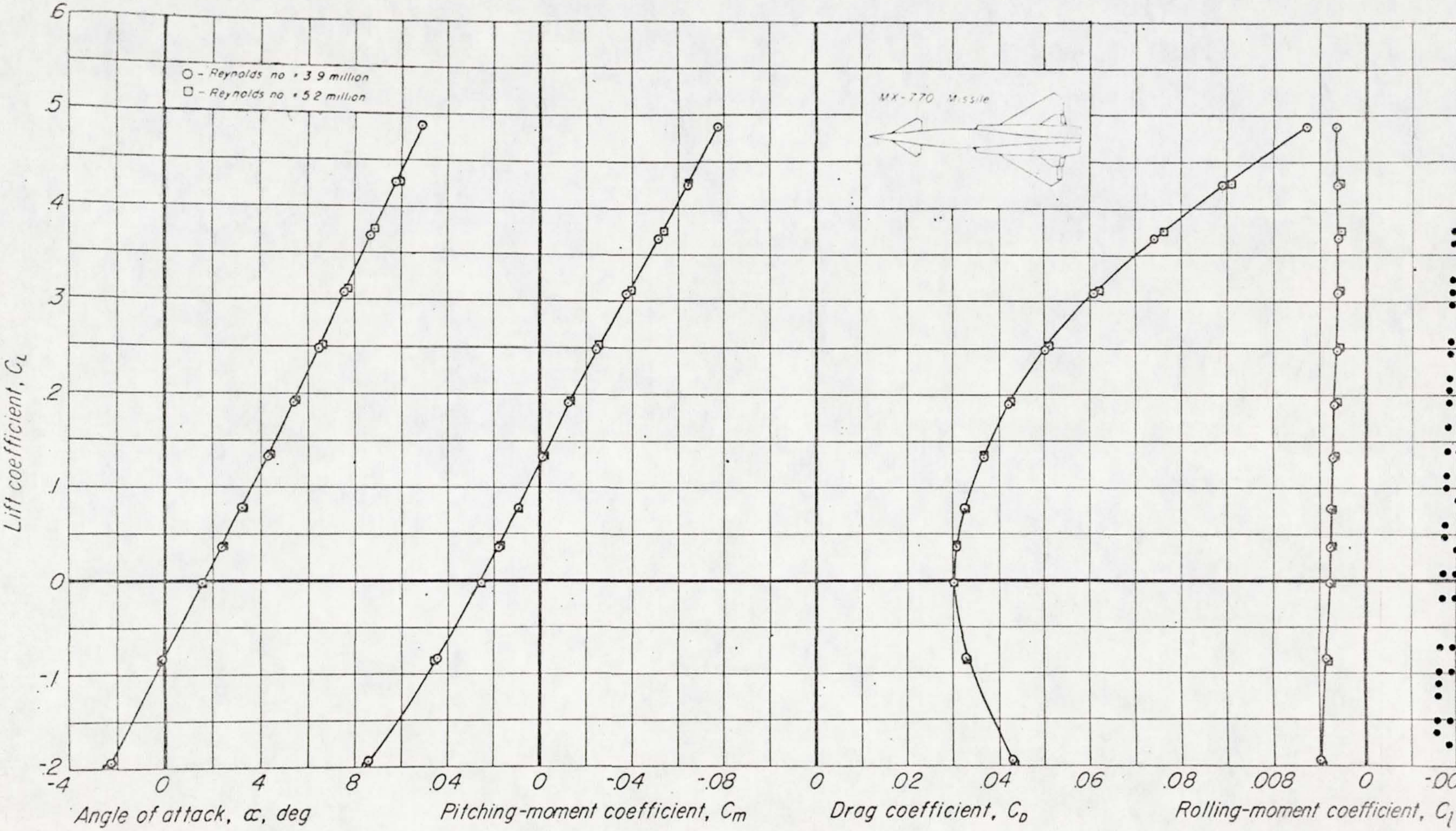
(a) $\delta_T = 0°$, $\delta_E = 0°$, $\delta_R = 0°$

Figure 4.–Effect of Reynolds number on the aerodynamic characteristics of the 0.07-scale MX-770 model at a Mach number of 1.4 for various control-surface deflections.



(b) $\delta_T = 5°, \delta_E = 0°, \delta_R = 0°$

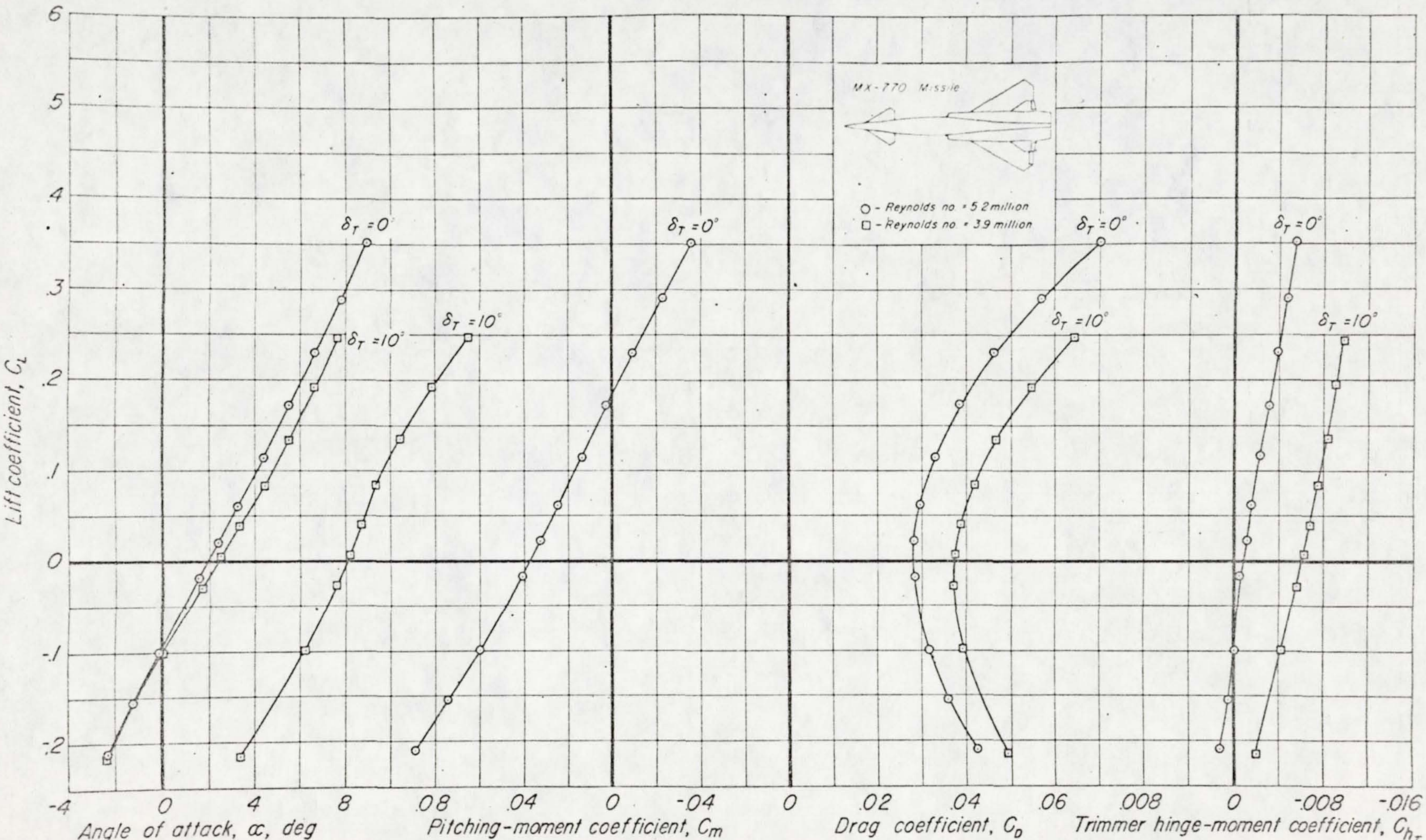
Figure 4.-Continued.



(c) $\delta_T = 0^\circ;\ \delta_E = 10^\circ;\ \delta_R = 0^\circ$

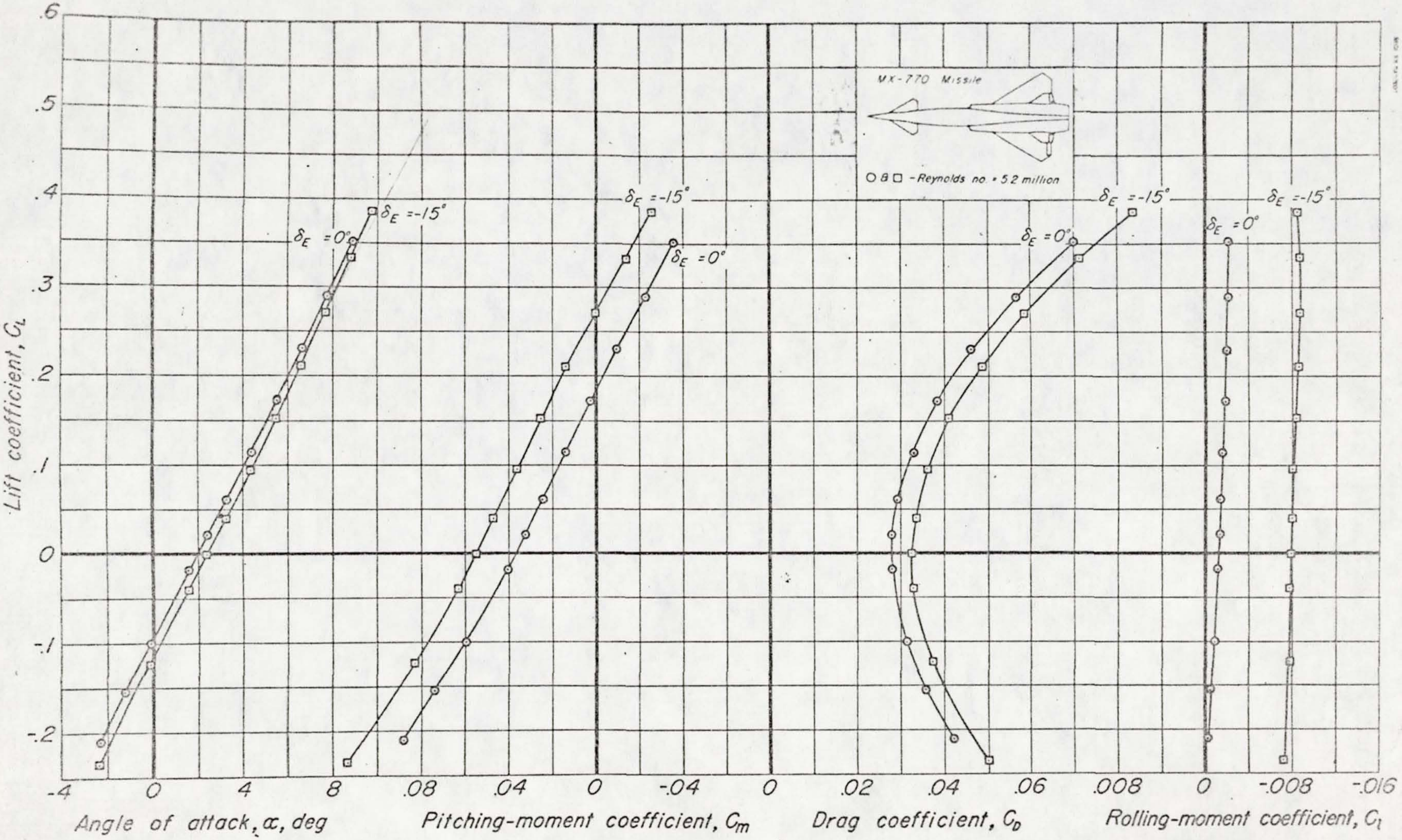
(Data for one elevon)

Figure 4.- Concluded.



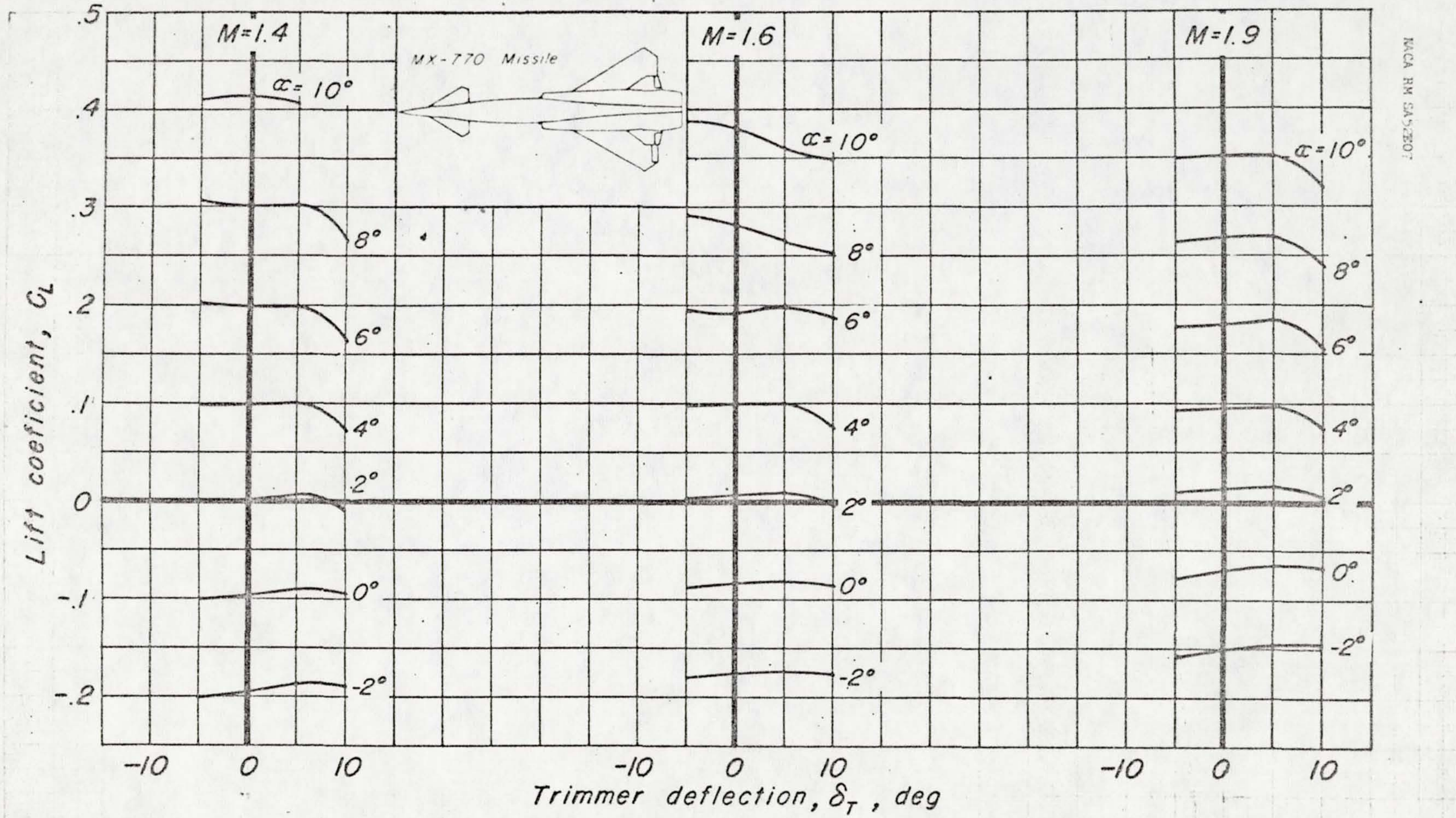
(a) $\delta_E = 0$, $\delta_R = 0$

Figure 5.-The effect of control-surface deflections on the aerodynamic characteristics of the 0.07-scale MX-770 model at a Mach number of 1.4.



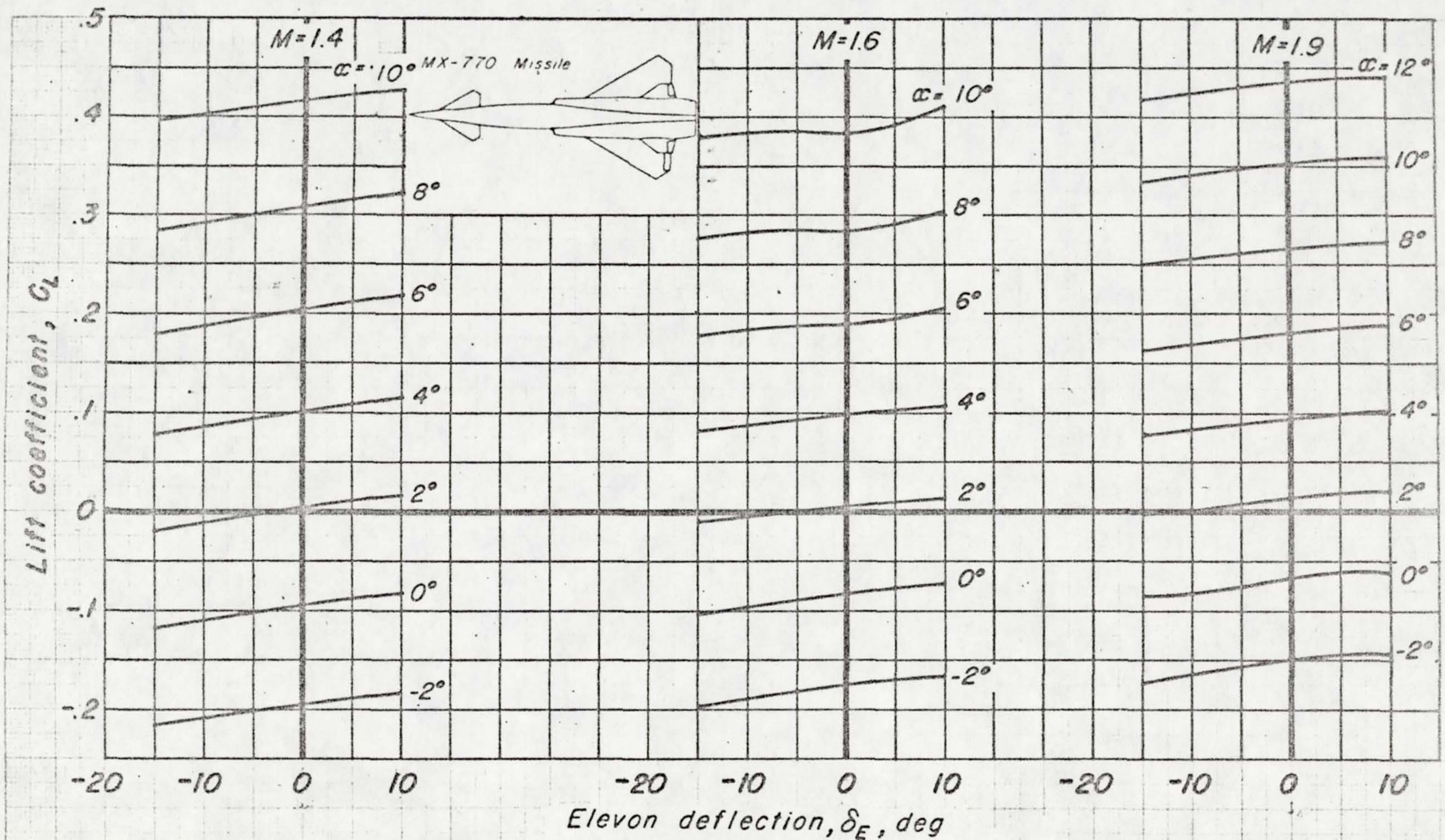
(b) $\delta_T = 0$, $\delta_R = 0$
(Data for one elevon)

Figure 5.-Concluded.



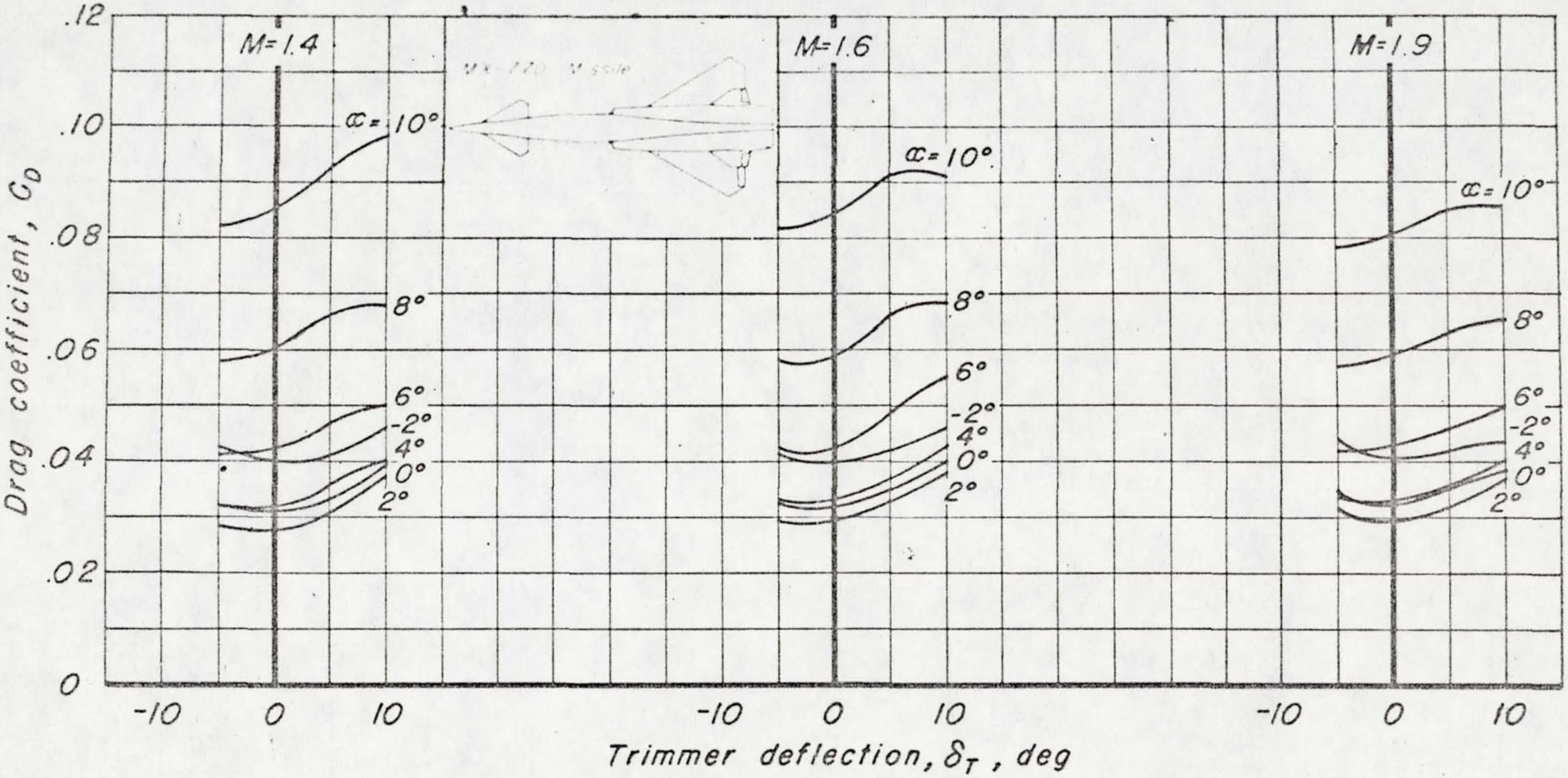
(a) C_L vs. δ_T

Figure 6.—Variation of lift coefficient with trimmer and elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model.



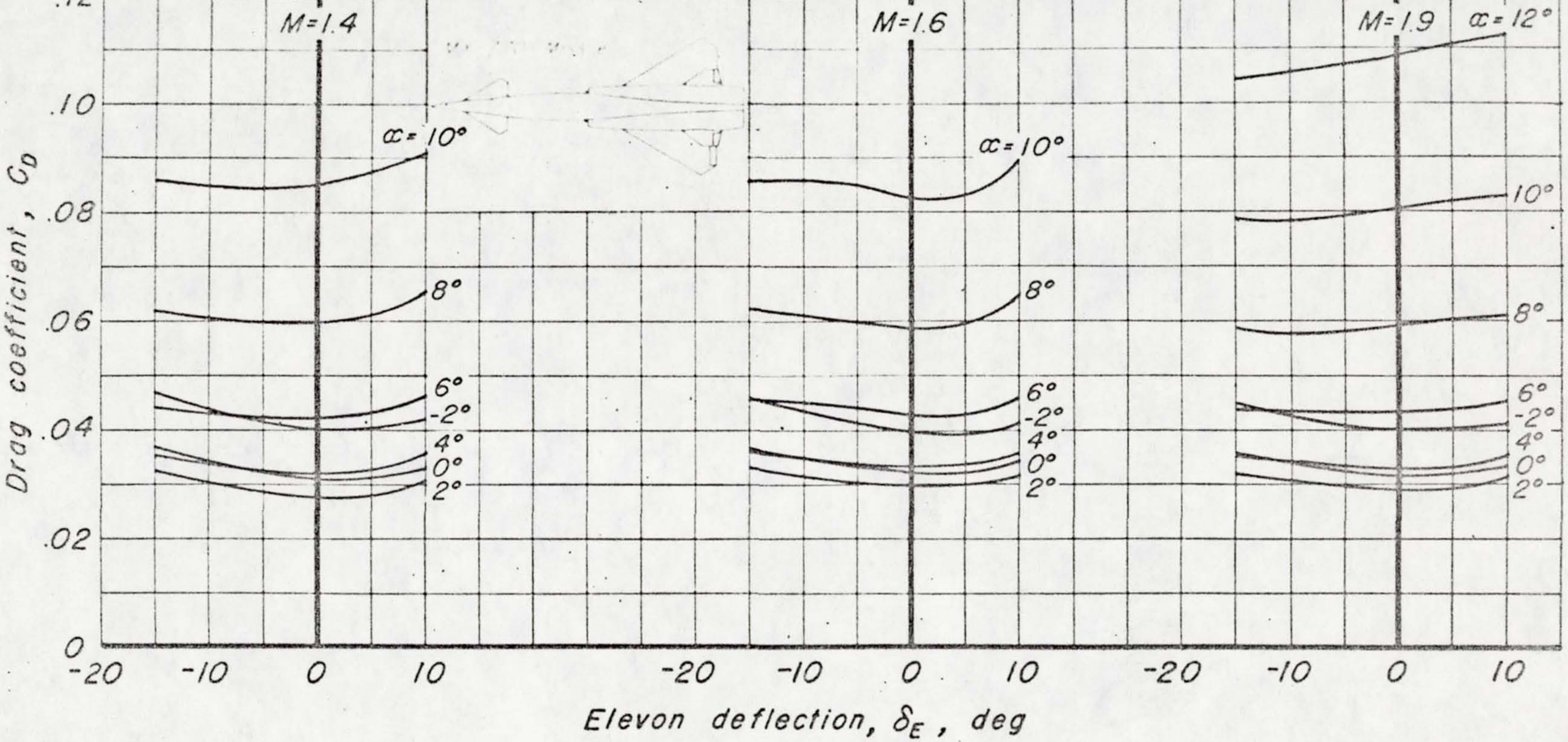
(b) C_L vs δ_E
(Data for one elevon)

Figure 6.—Concluded.



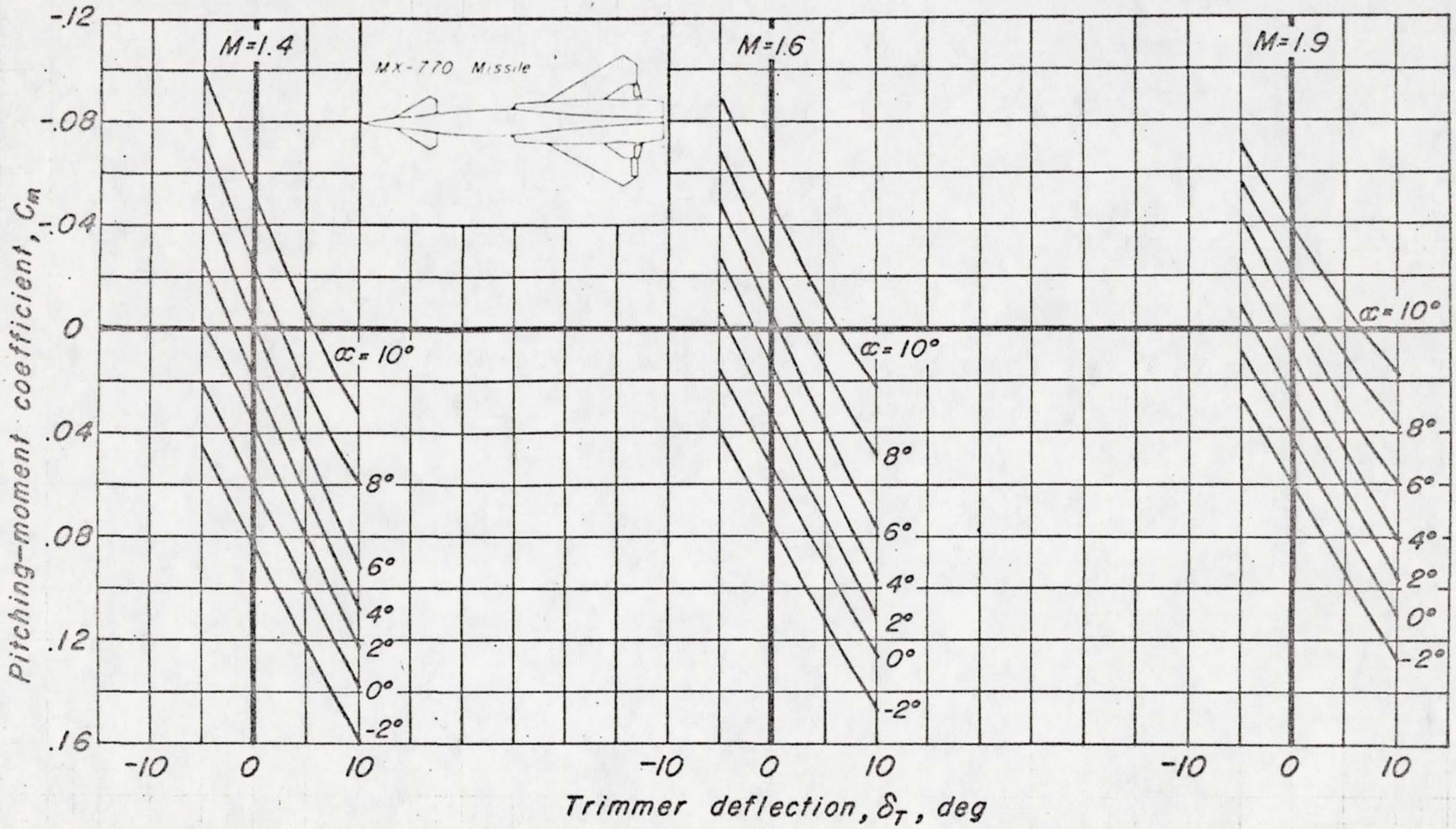
(a) C_D vs δ_T

Figure 7.- Variation of drag coefficient with trimmer and elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model.



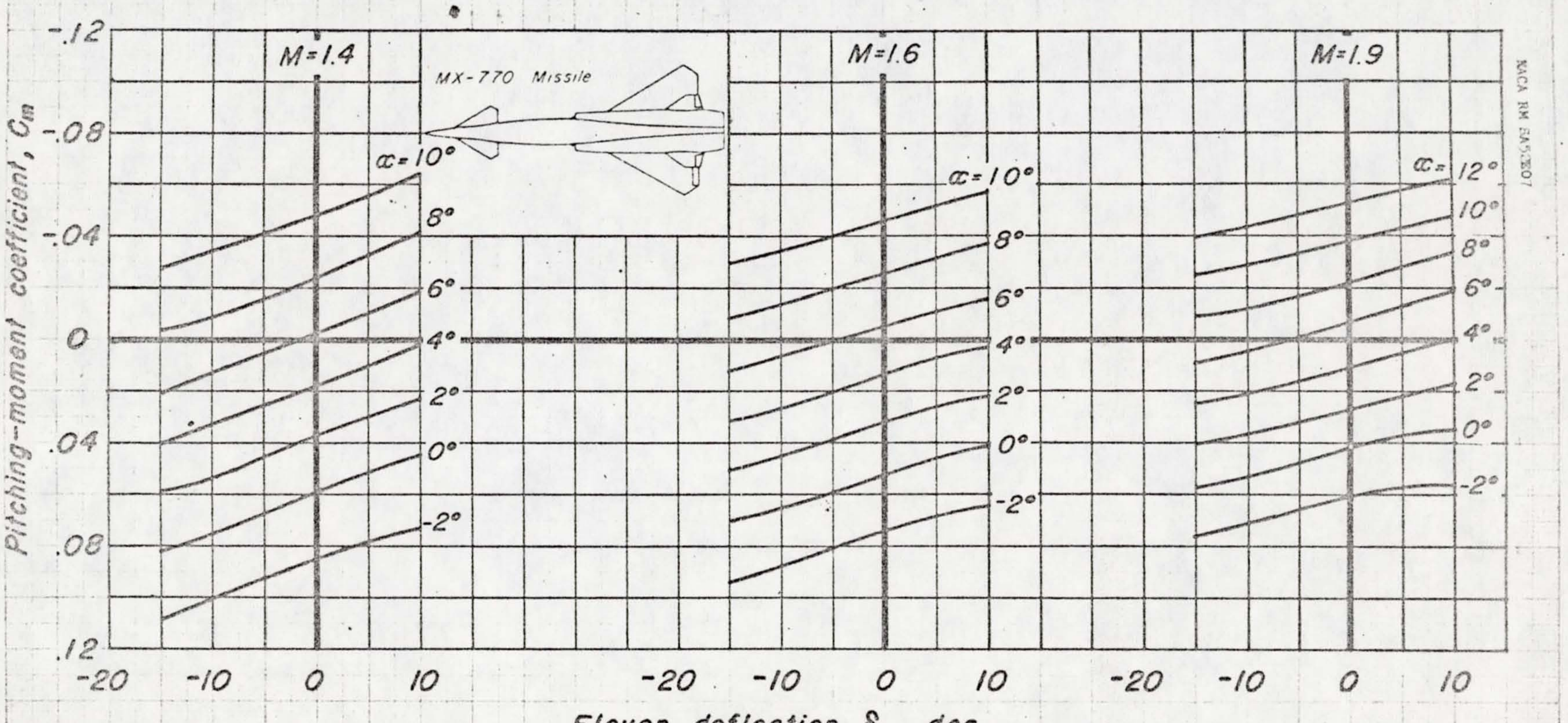
(b) C_D vs δ_E
(Data for one elevon)

Figure 7.-Concluded.



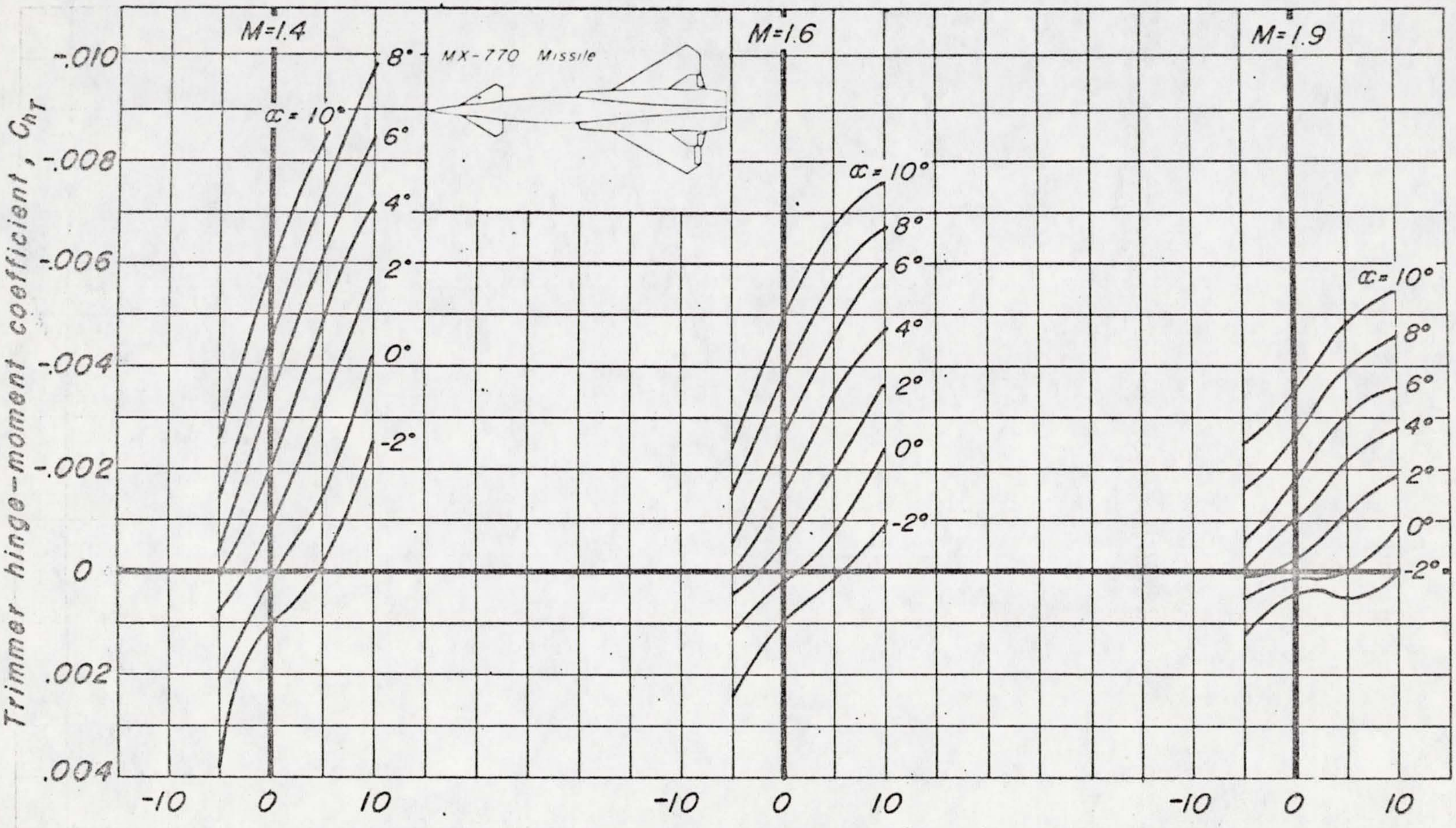
(a) C_m vs δ_T

Figure 8.—Variation of pitching-moment coefficient with trimmer and elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model.



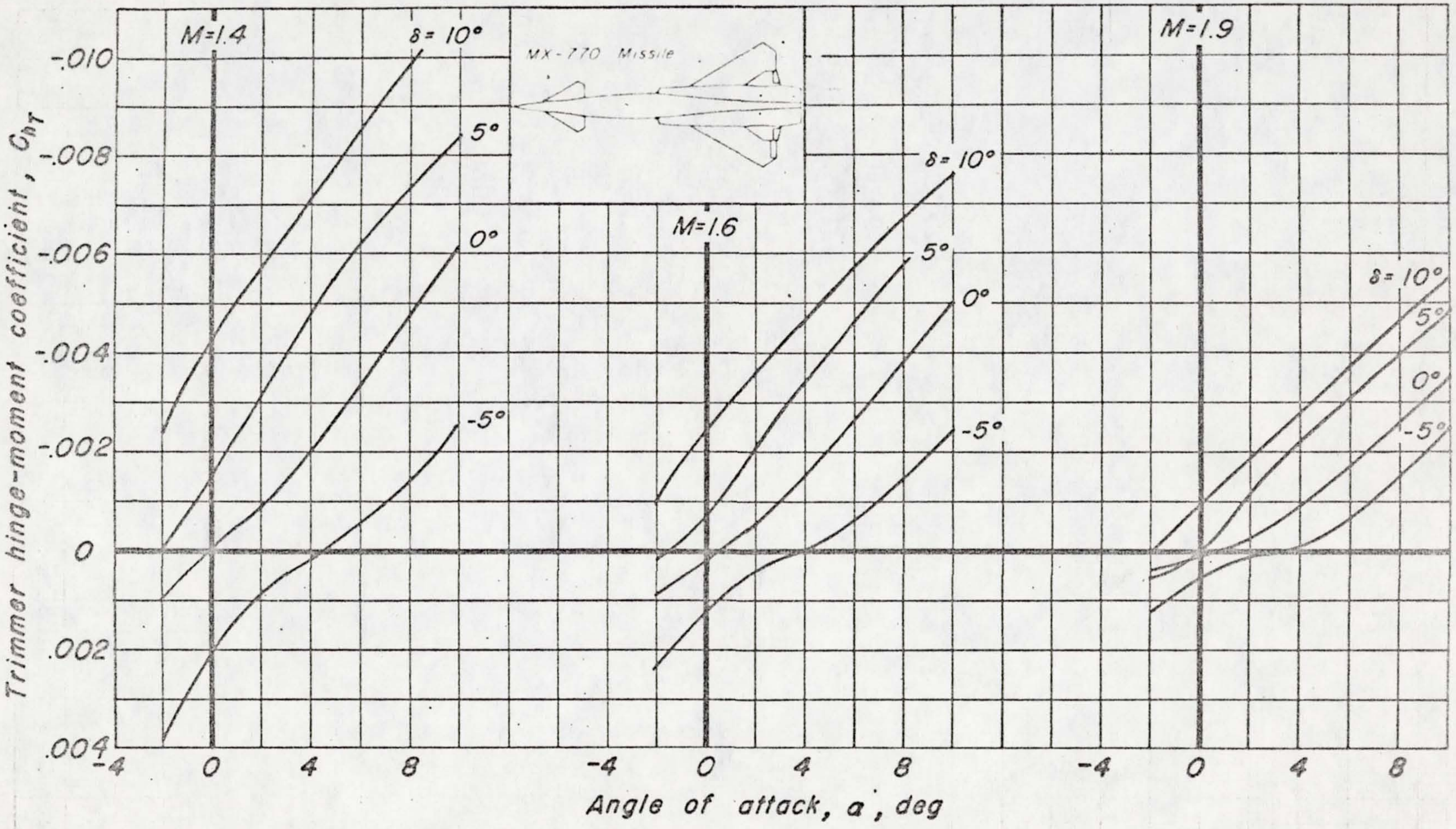
(b) C_m vs δ_E
(Data for one elevon)

Figure 8.-Concluded.



(a) C_{h_T} vs. δ_T

Figure 9.- Variation of trimmer hinge-moment coefficient with trimmer deflection and angle of attack at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model.



(b) C_{h_T} vs. α

Figure 9.—Concluded.

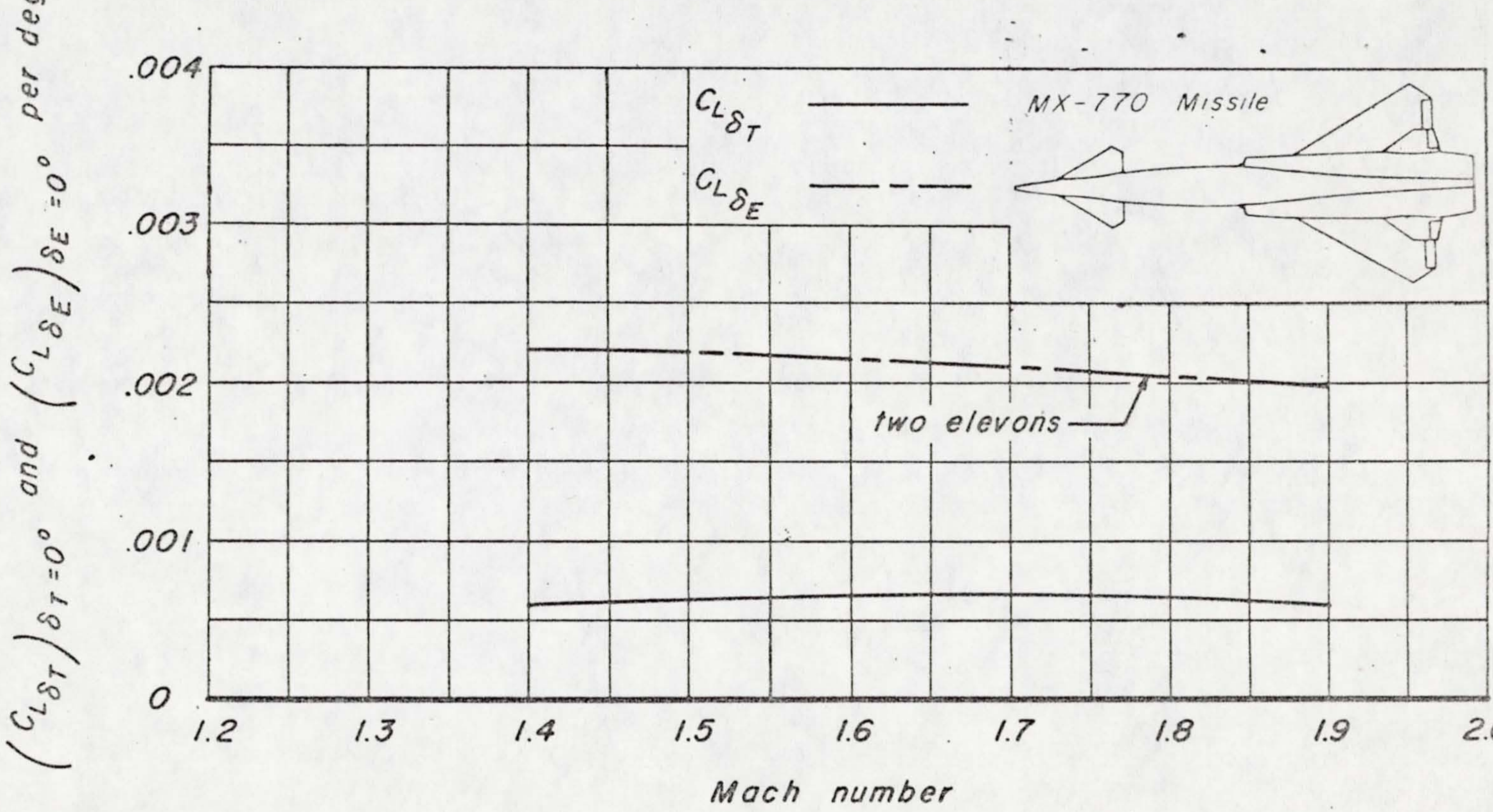


Figure 10.— The effect of Mach number on the lift-effectiveness parameters $C_{L_{\delta_T}}$ and $C_{L_{\delta_E}}$ for the 0.07-scale MX-770 model; δ_E and $\delta_R = 0^\circ$ for $C_{L_{\delta_T}}$ and δ_T and $\delta_R = 0^\circ$ for $C_{L_{\delta_E}}$, $\alpha = 2^\circ$.

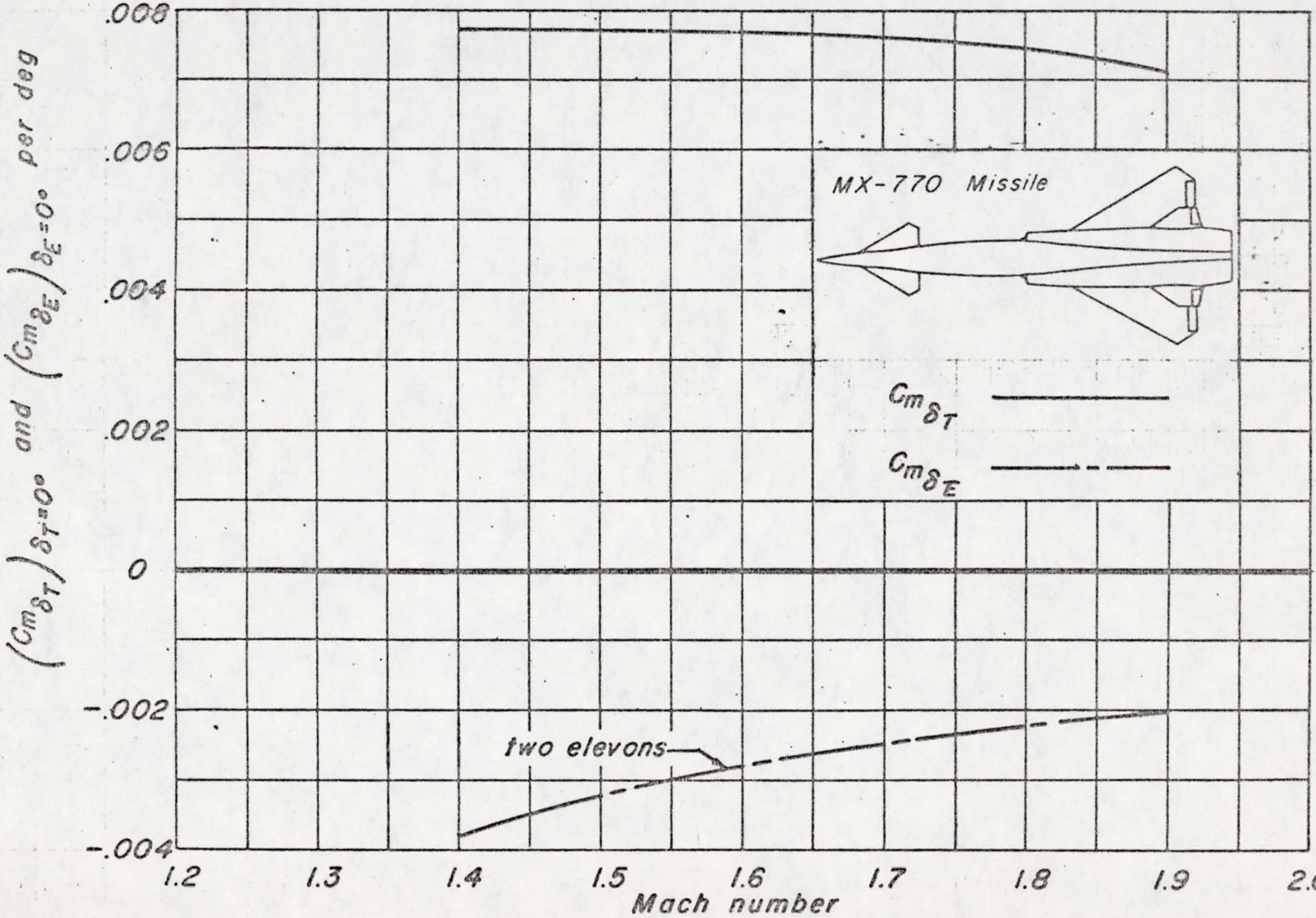


Figure 11.-The effect of Mach number on the pitching-moment effectiveness parameters $C_{m_{\delta_T}}$ and $C_{m_{\delta_E}}$ for the 0.07-scale MX-770 model; δ_E and $\delta_R = 0°$ for $C_{m_{\delta_T}}$ and δ_T and $\delta_R = 0°$ for $C_{m_{\delta_E}}$; $\alpha = 2°$.

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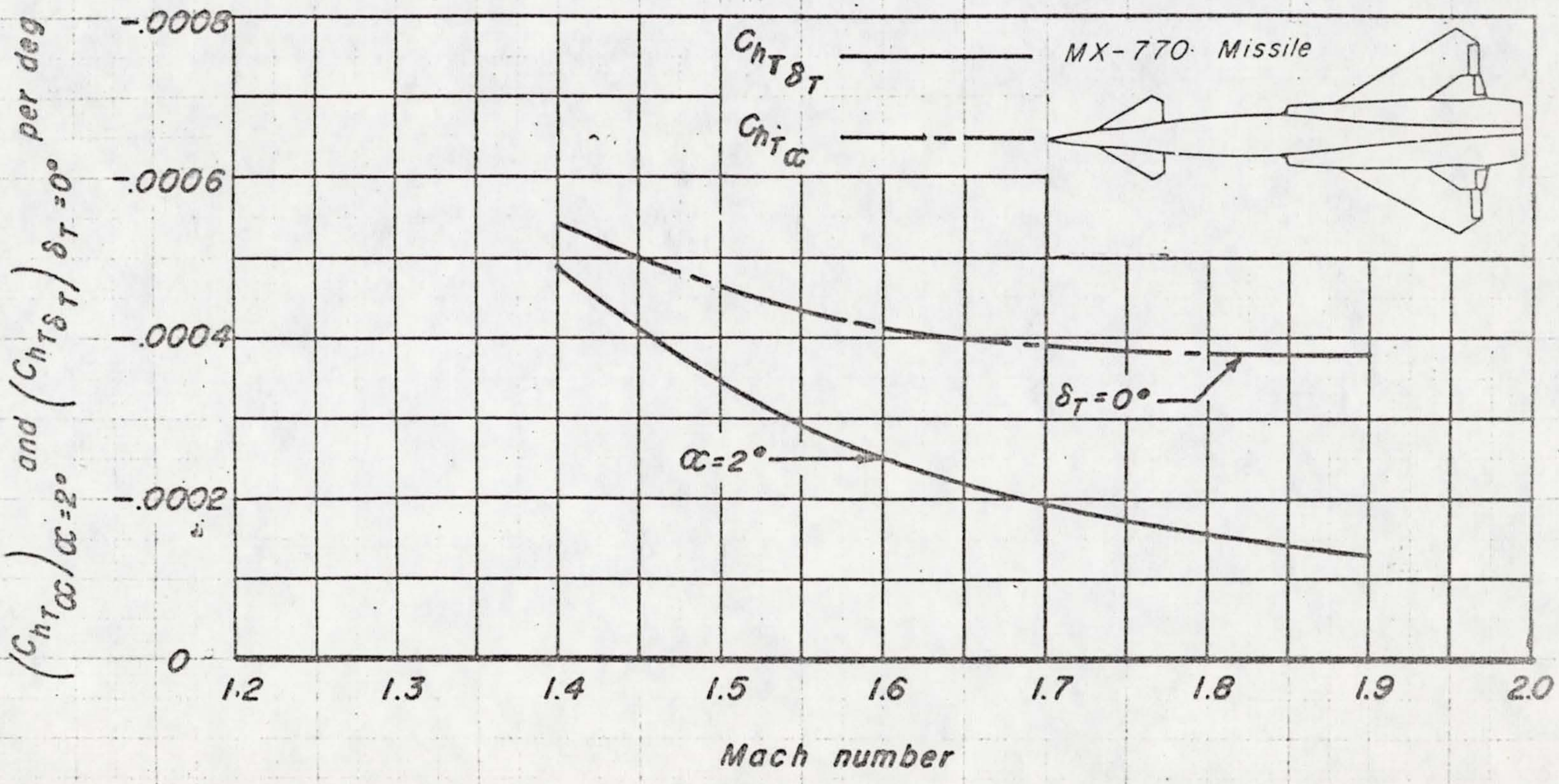


Figure 12.–The effect of Mach number on the rate of change of hinge-moment coefficient with change in trimmer deflection and angle of attack for the 0.07-scale MX-770 model, δ_E and δ_R = 0°.

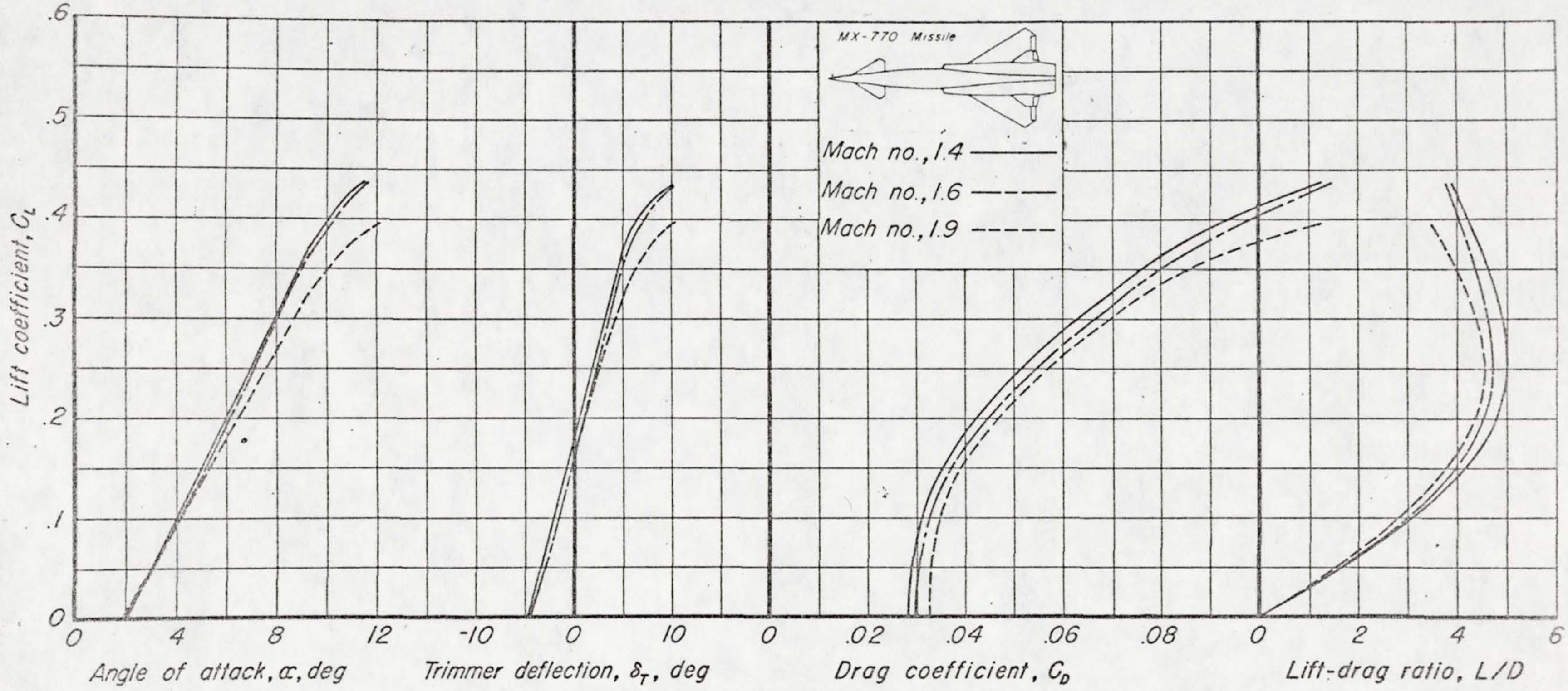


Figure 13.–The relationship between the balance lift coefficient and α, δ_T, C_D, and L/D for Mach numbers of 1.4, 1.6, and 1.9; δ_E and $\delta_R = 0$.

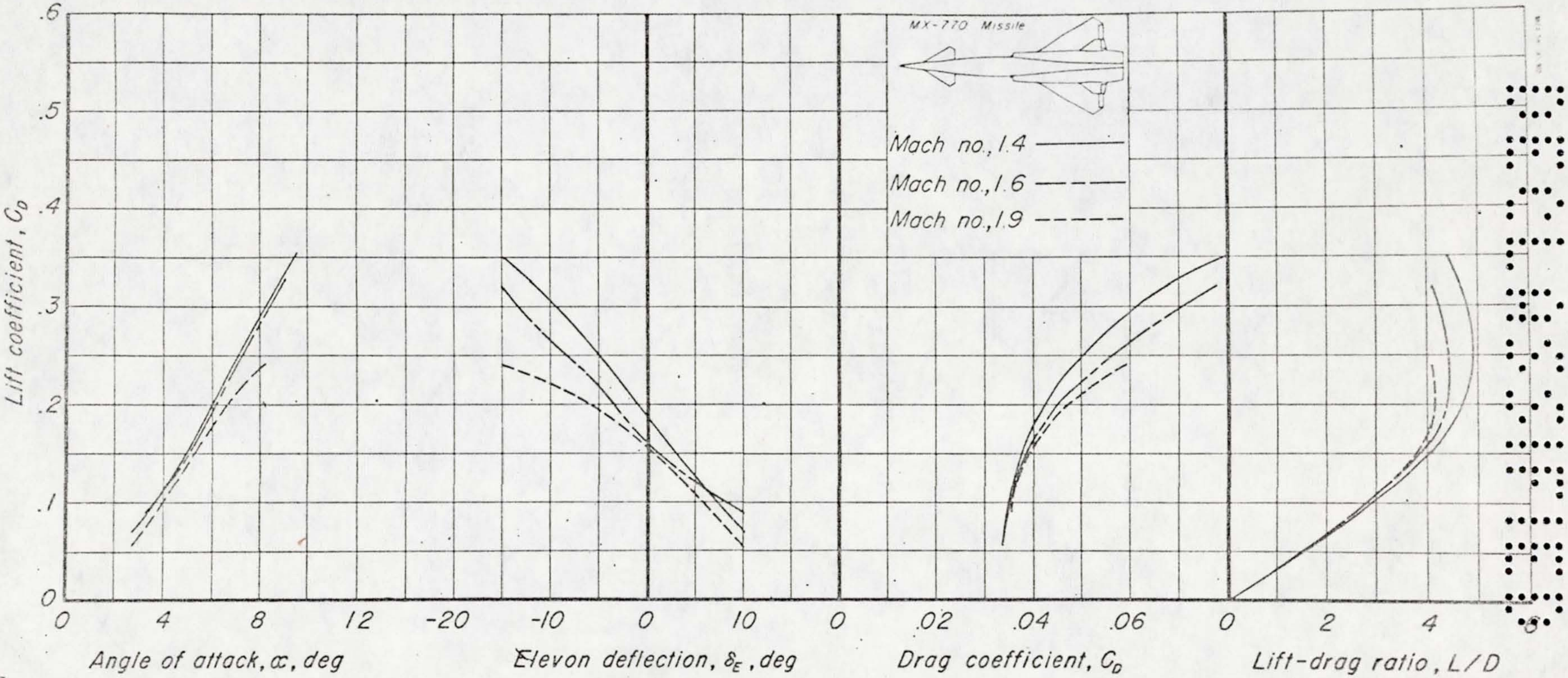


Figure 14.-The relationship between the balance lift coefficient and α, δ_E, C_D, and L/D for Mach numbers of 1.4, 1.6, and 1.9. Data for two elevons; δ_T and $\delta_R = 0$.

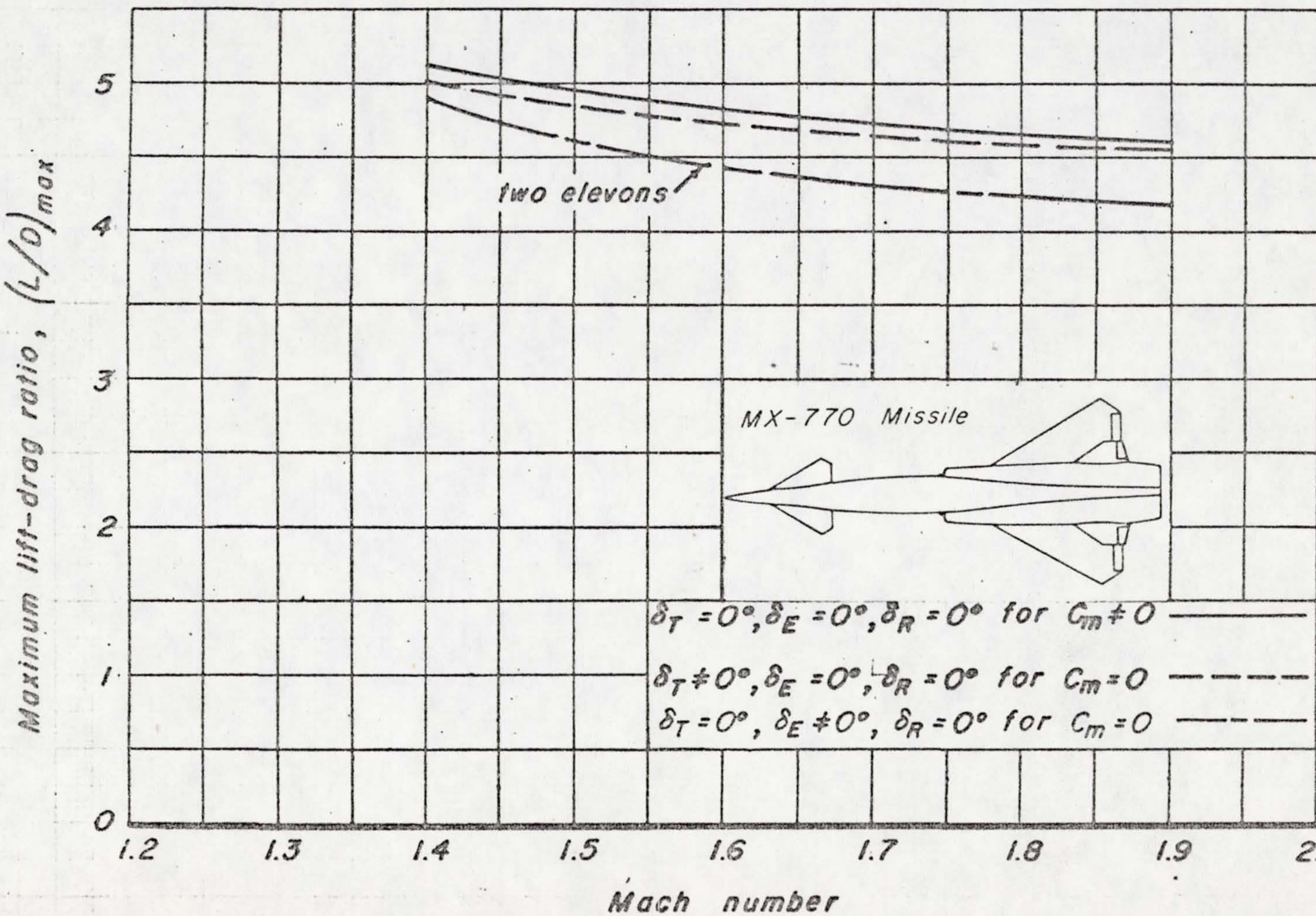
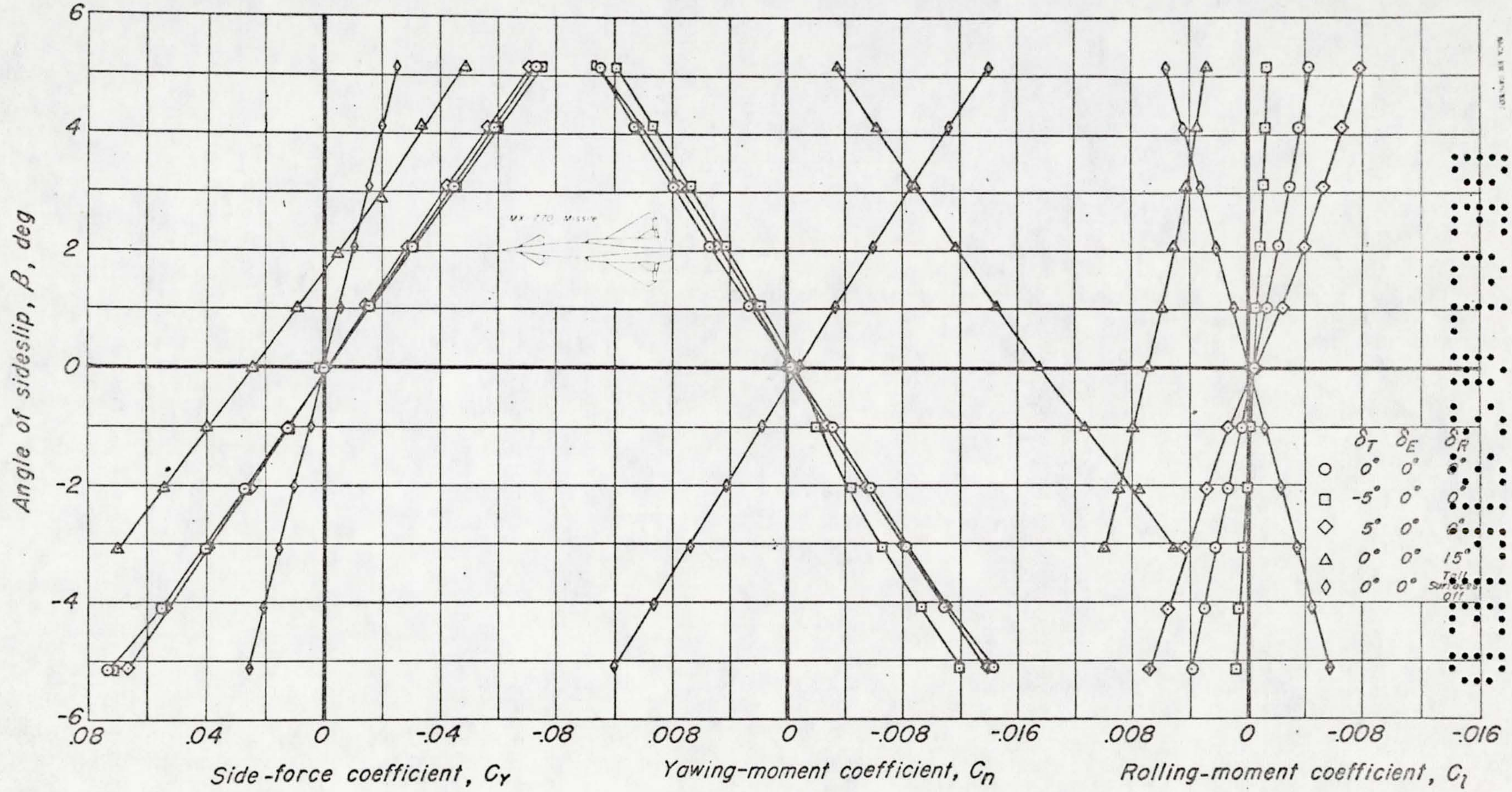


Figure 15.- The effect of Mach number on the maximum lift-drag ratio for the 0.07-scale MX-770 model.



(a) $\alpha = 2.5°$

Figure 16.- The effect of sideslip angle, β, on the lateral characteristics of the 0.07-scale MX-770 model at two angles of attack. Reynolds number, 5.2 million. Mach number, 1.4.

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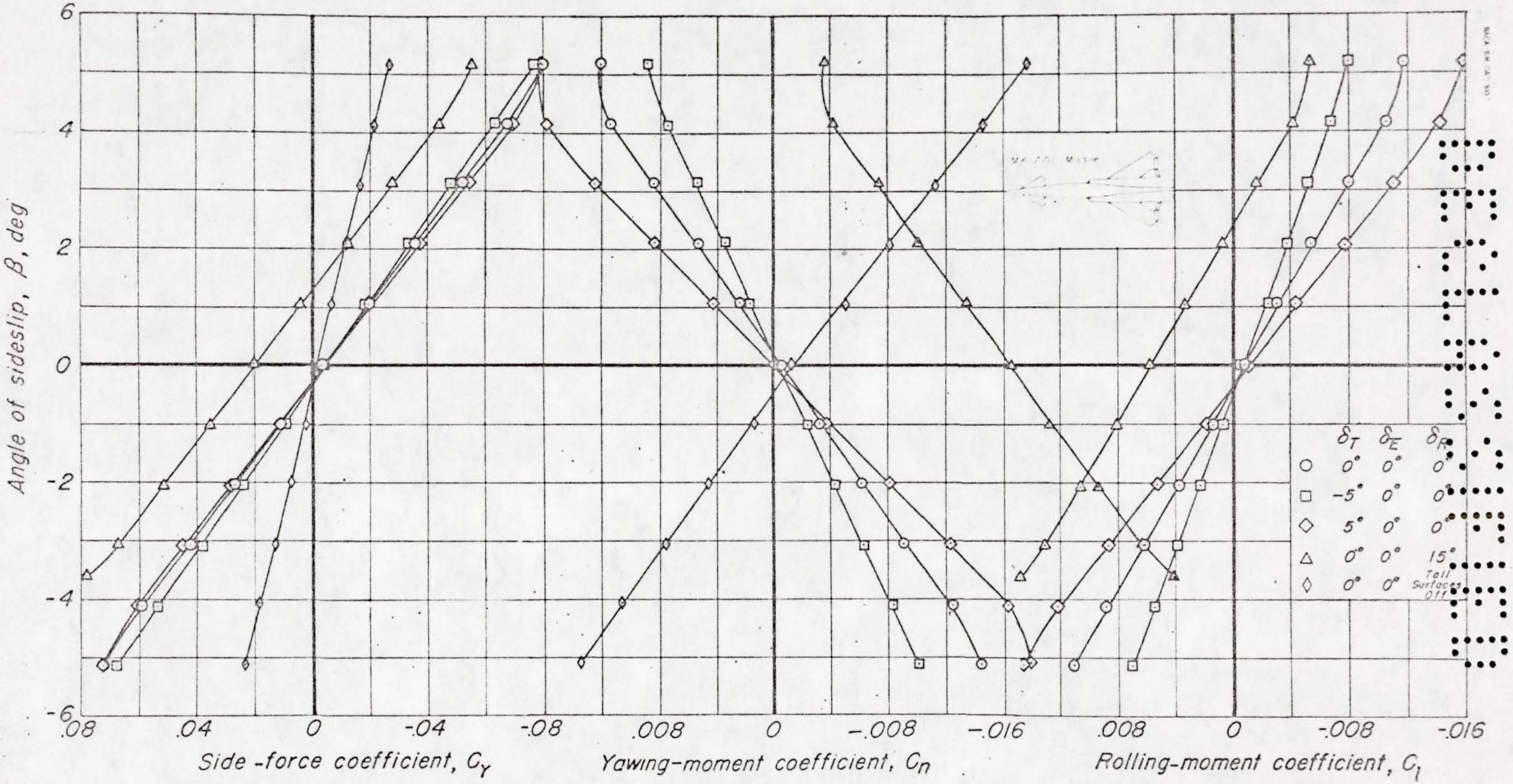

(b) $\alpha = 8.2°$

Figure 16.- Concluded.

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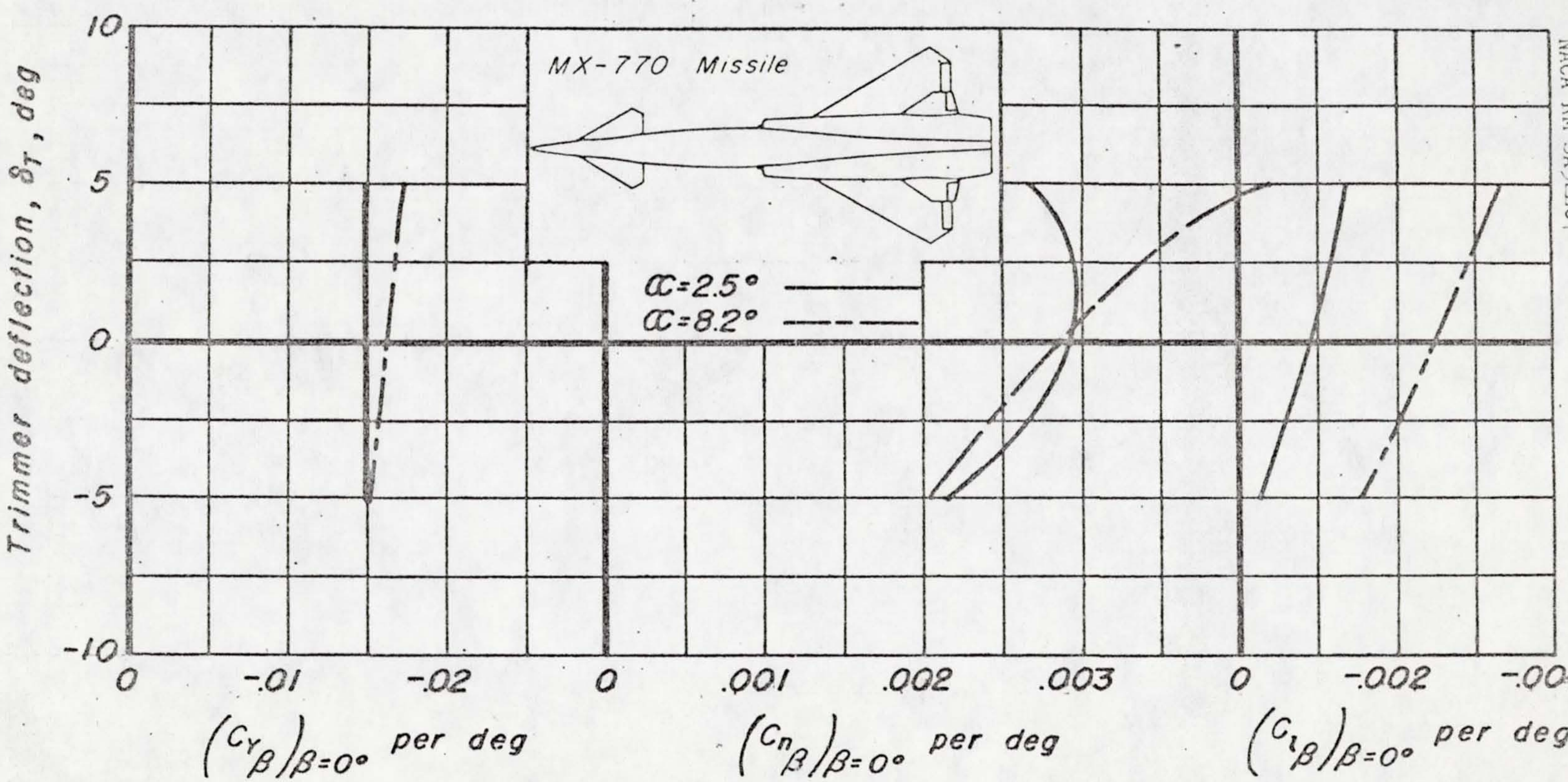

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Figure 17.- The effect of trimmer deflection on the lateral-stability derivatives C_{Y_β}, C_{n_β}, and C_{l_β} of the 0.07-scale MX-770 model; δ_E and $\delta_R = 0°$.

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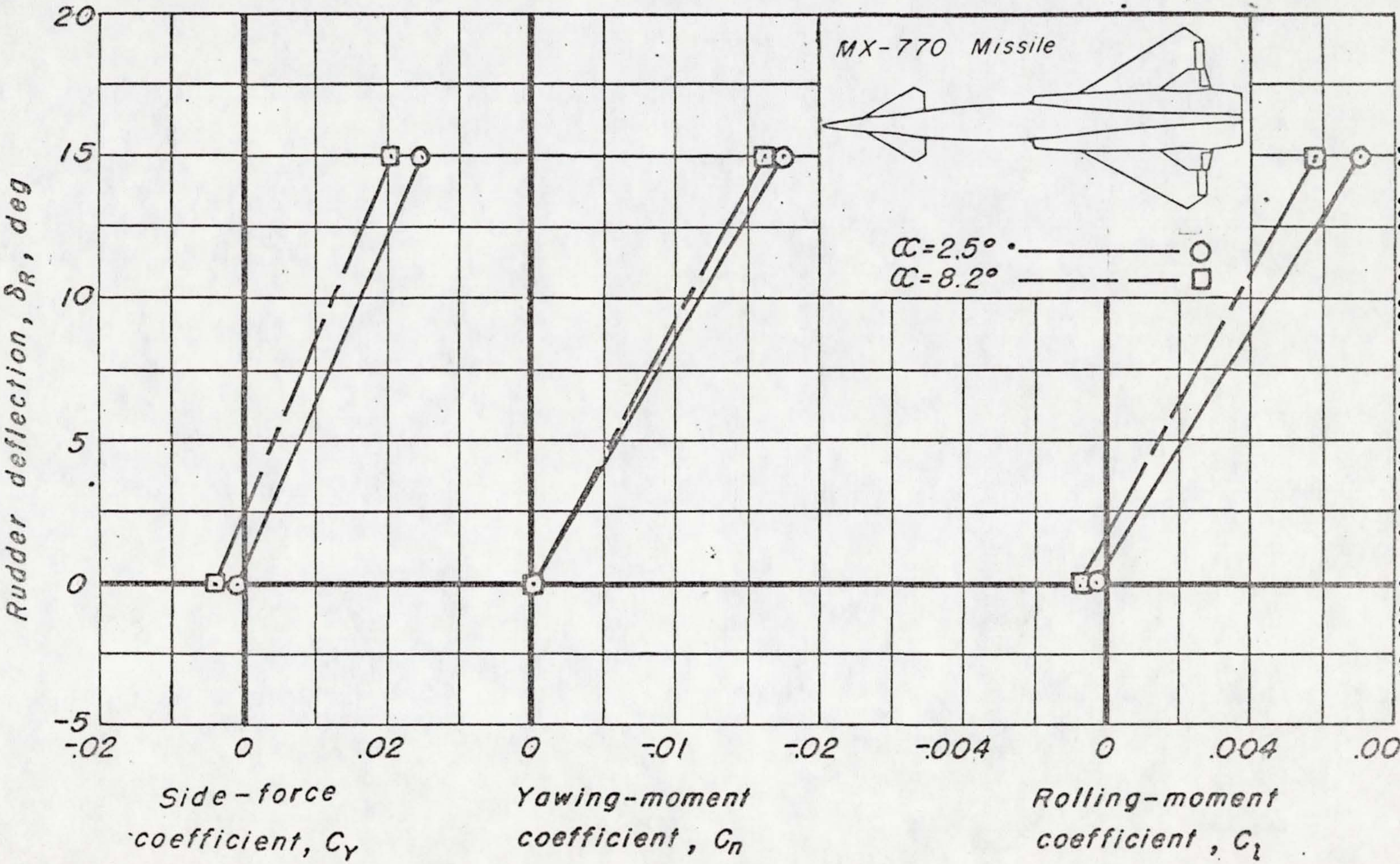

Figure 18.–The effect of rudder deflection on the lateral characteristics of the 0.07-scale MX-770 model; M=1.4, δ_T, δ_E, and β=0°.

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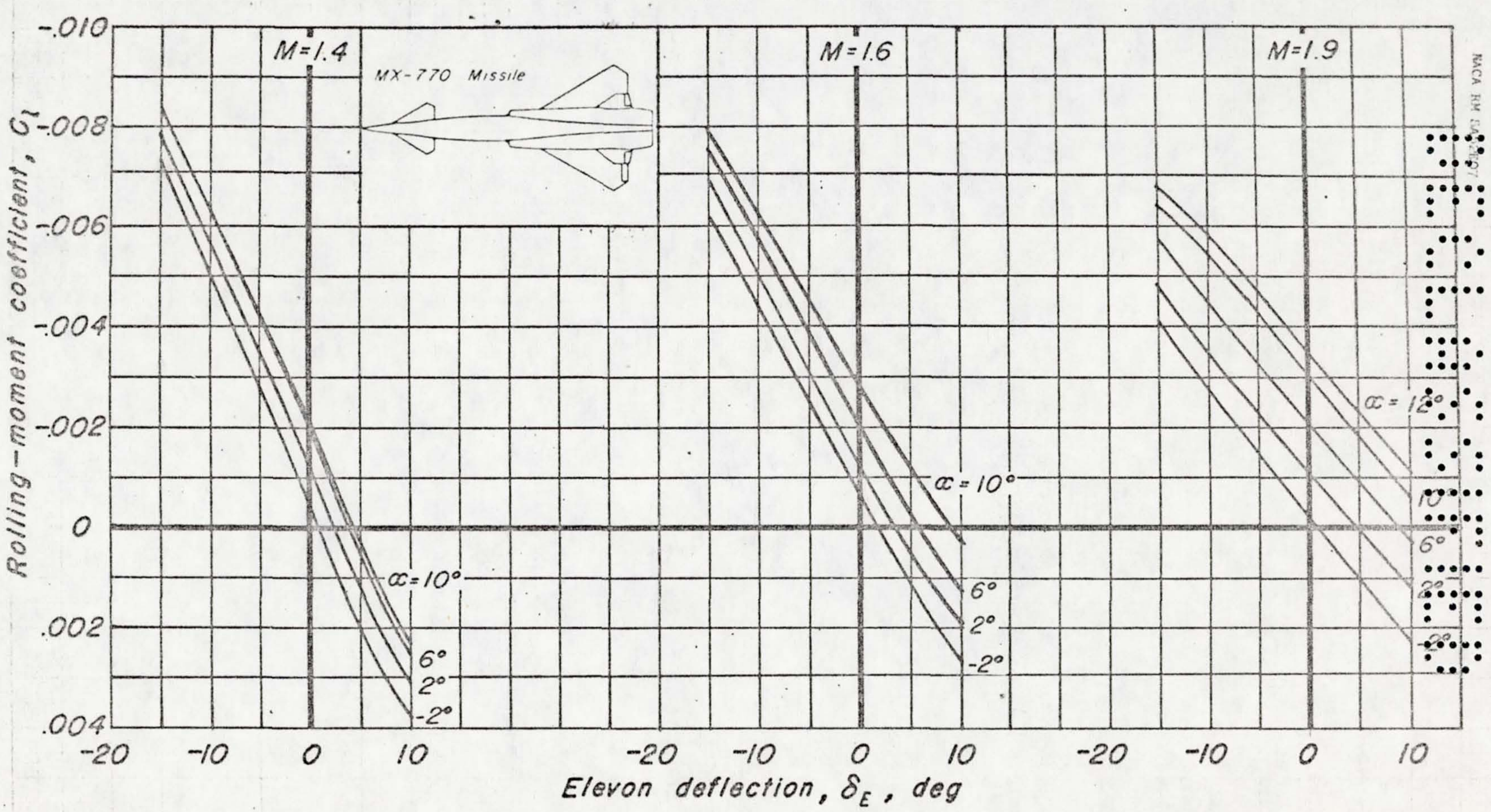

Figure 19.–Variation of rolling-moment coefficient with elevon deflection at Mach numbers of 1.4, 1.6, and 1.9 for the 0.07-scale MX-770 model. Data for one elevon; $\beta = 0°$.

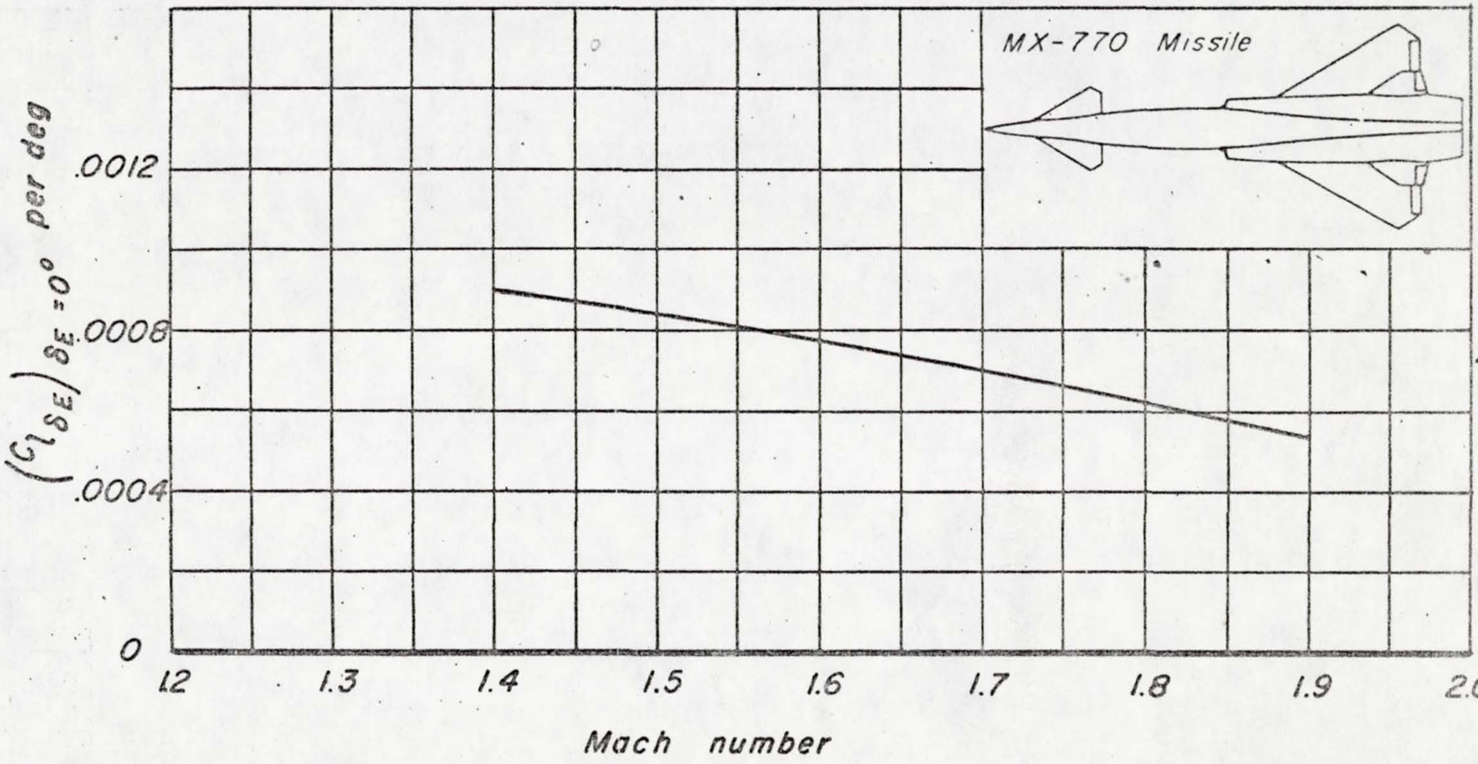

Figure 20.—The effect of Mach number on the rolling-moment effectiveness parameter $C_{l_{\delta_E}}$ for the 0.07-scale MX-770 model. Two elevons, δ_T and $\delta_R = 0^\circ$, $\alpha = 2^\circ$.